

Soil Management for Potatoes: What does the CSC tell us?

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POTATOES



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Introduction

CSC includes potatoes in the rotation

Does the sustainable management improve soil conditions for potato production? What soil management differences are there?

Questions as to the impact of potatoes on soil conditions:

changes within the beds during the season,
following harvests from soil,
as a result of planting operations.

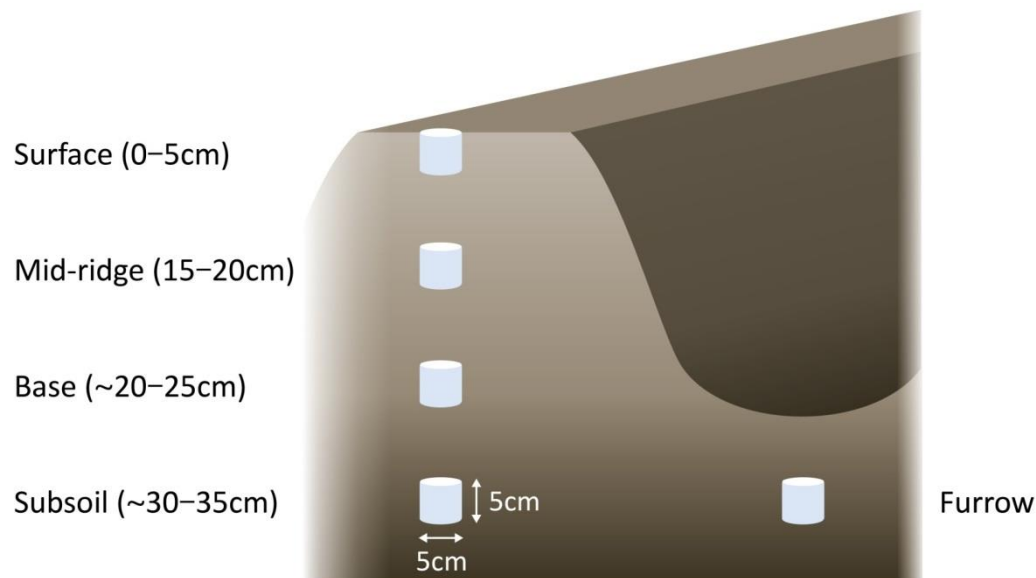
Introduction

Sampling in 2013, 2014, 2015 & 2016.

Sampling when potatoes as in diagram.

Subsoil at depth of cultivation.

When in cereal sample at 0, 15 & 30 cm – but comparisons only 0 & 30 cm.



Soil Physical Quality

The ability of a given soil to meet plant and ecosystem requirements for water, aeration, and strength over time and to resist and recover from processes that might diminish that ability.

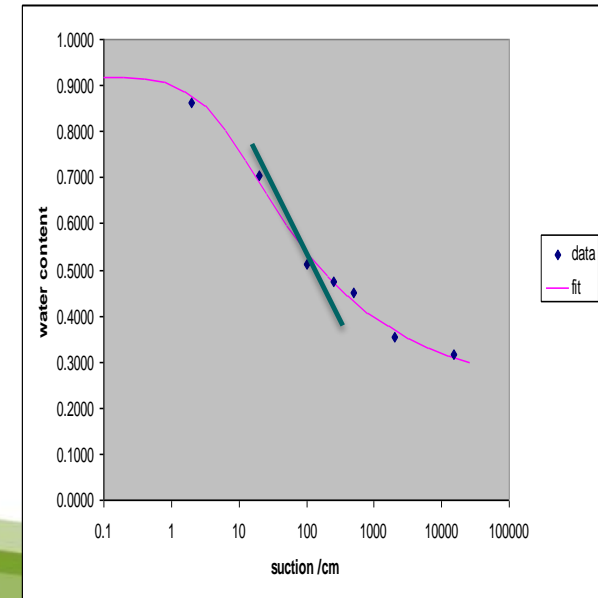
Relevant measures could include

Water Stable Aggregation (WSA) – wet sieving

Bulk density

“S”

Others – macroporosity, LLWR, PAW, EAW,

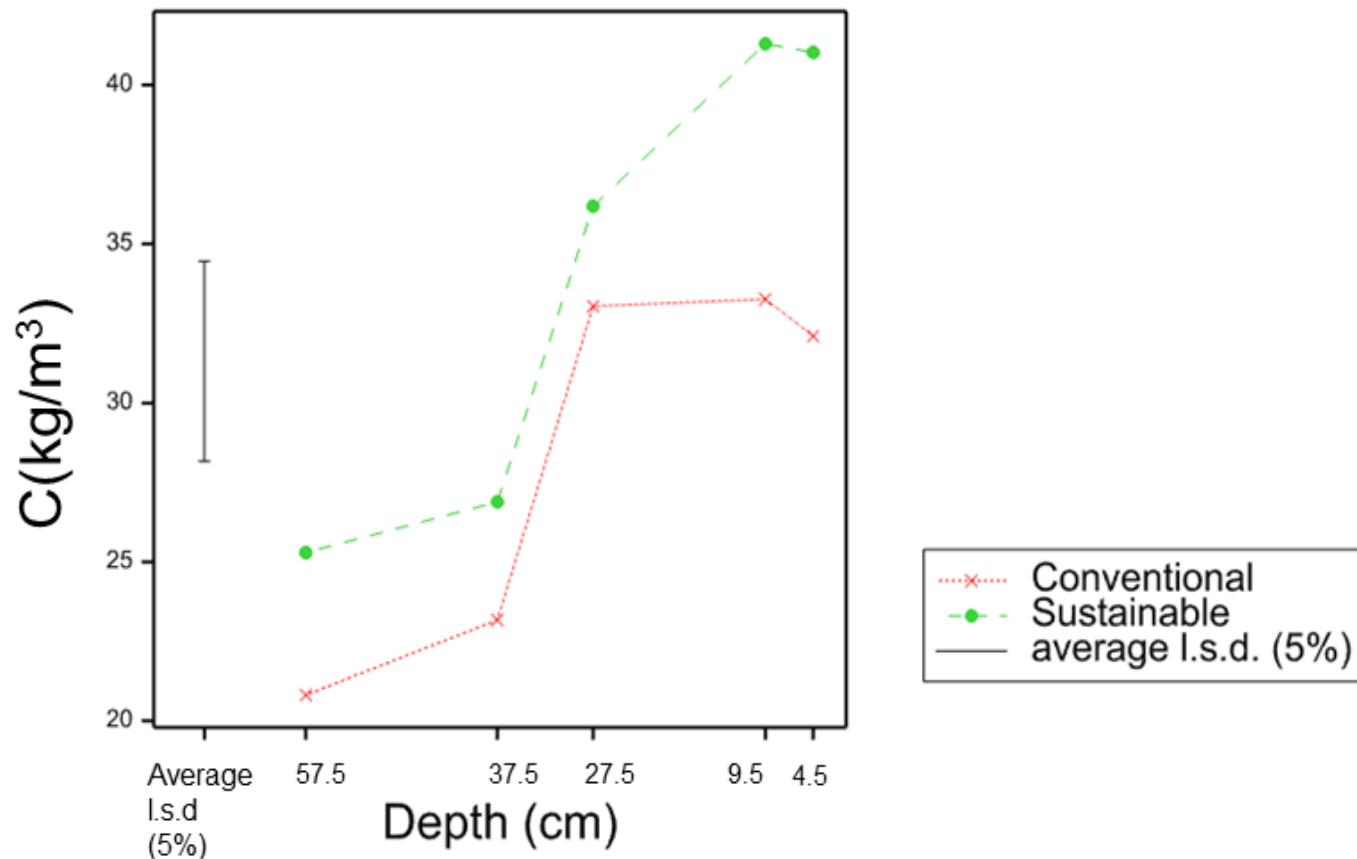


Soil Carbon

2014, Kennels field, winter barley

There is more carbon in the soil under the Sustainable Management.

Sampled to 60 cm depth and checked for bulk density.



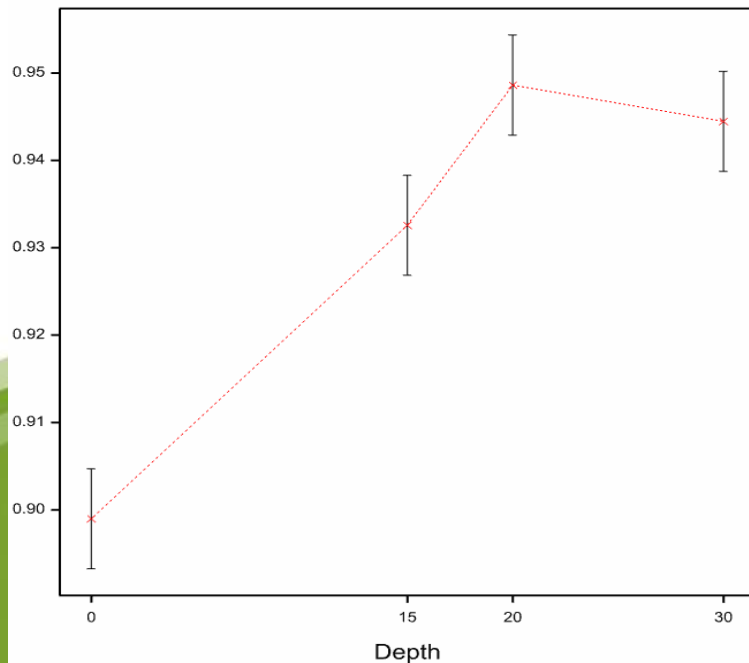
Soil stability WSA pre-harvest 4-years

Soil is least stable at the surface.

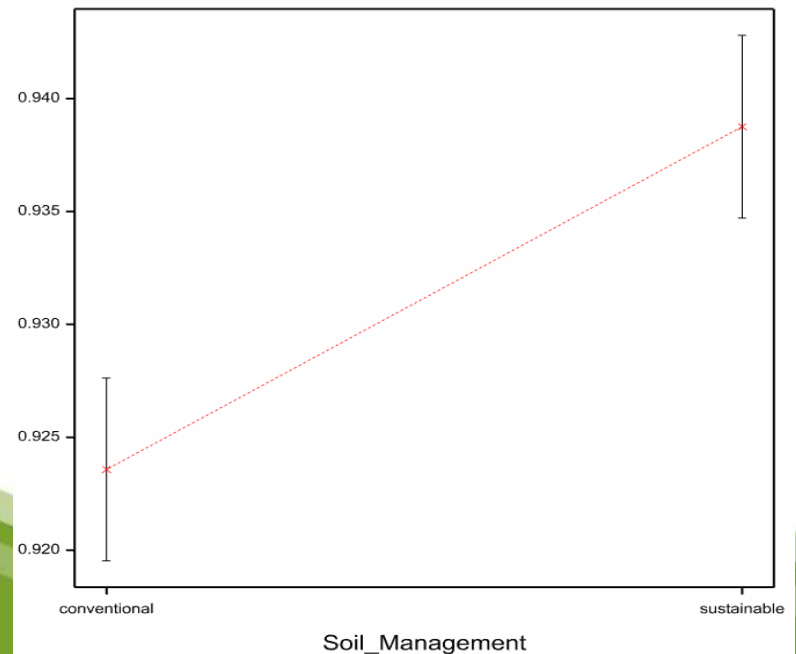
Soil is more stable in the sustainable treatment.

Differences are statistically significant, but between treatments are probably not agronomically important as both are very stable.

Mean 0.25mm WSA



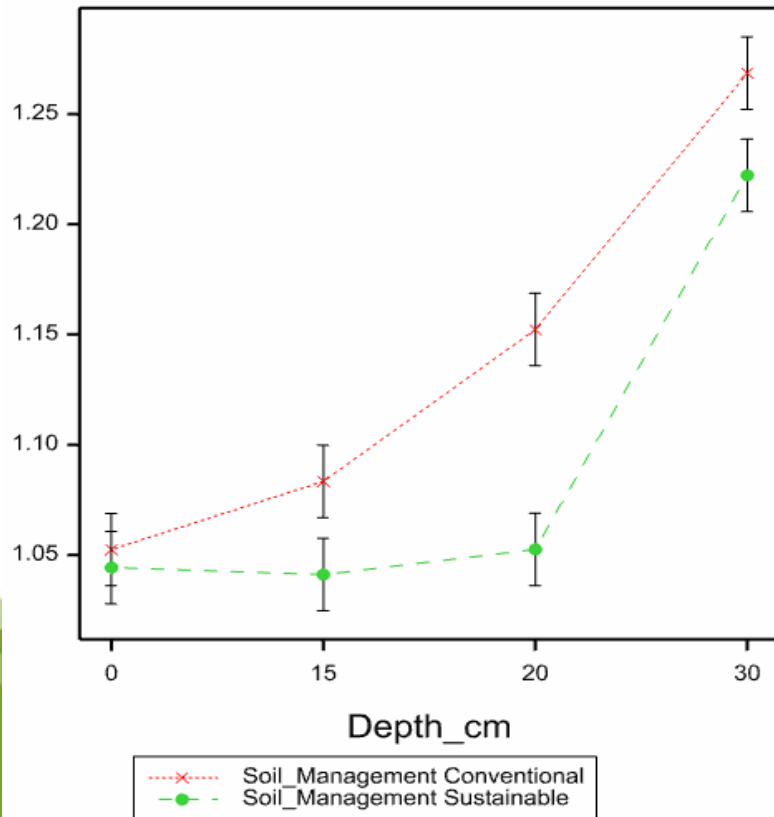
Mean 0.25mm WSA



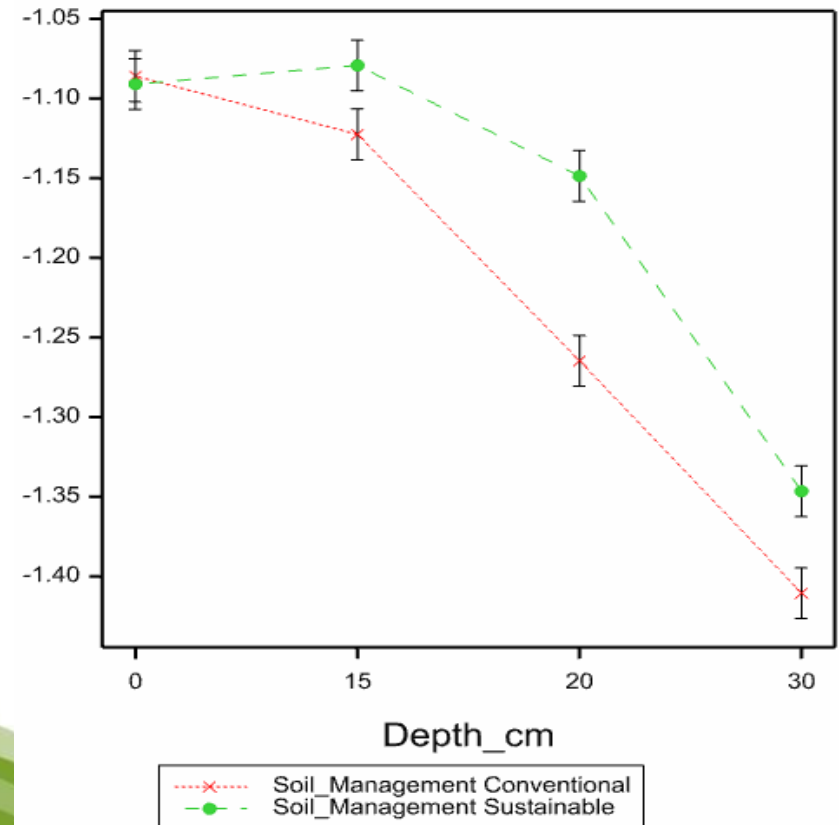
Conditions pre-harvest

Soil in surface not different, but conditions are better throughout the potato bed .

Mean Bulk_Density_MS_VT_g_cm3



Mean log₁₀(S)



Performance of Potato beds



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Differences due to compost addition i.e. more organic matter (anything else)?

Soil is least stable at the surface.

Soil is more stable in sustainable.

Soil in sustainable is “better” at depth of tuber expansion

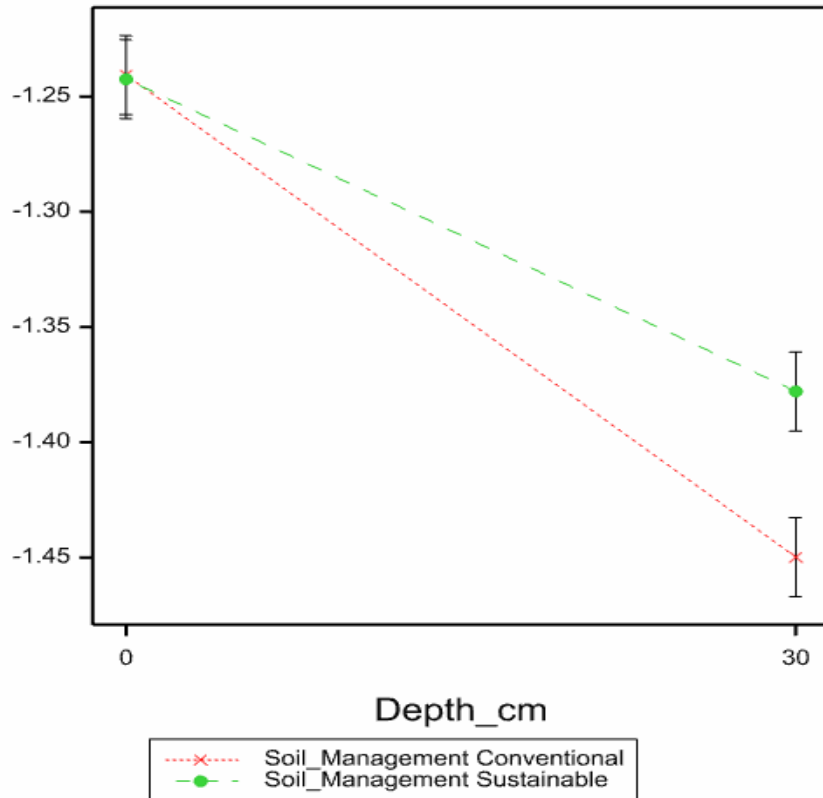
Post-planting to pre-harvest & post-harvest

Differences between managements is of marginal significance.

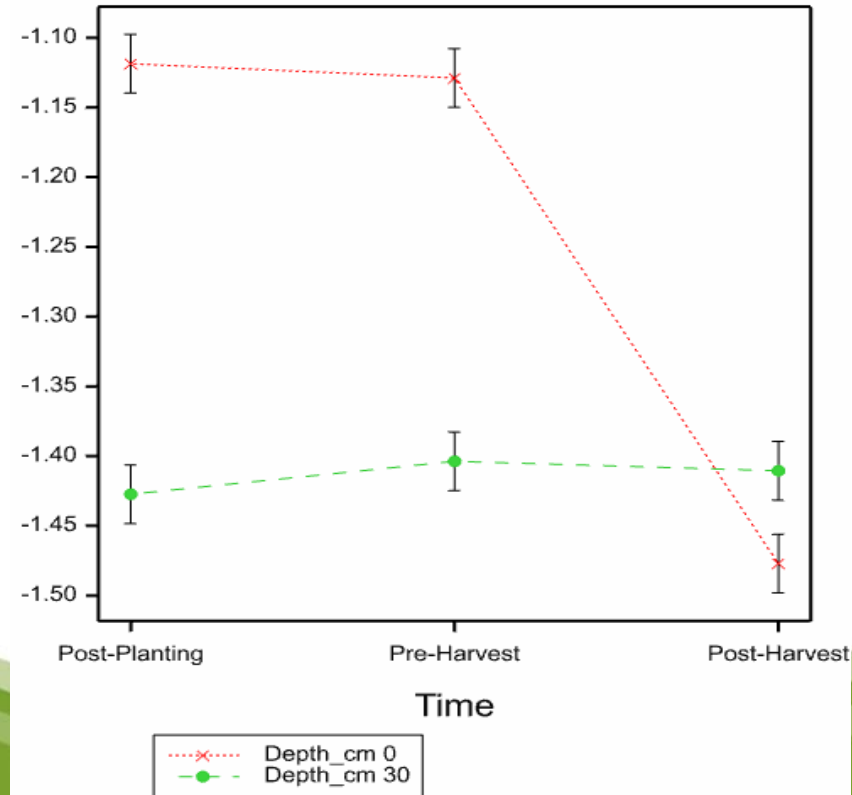
Over multiple years

Similar response for e.g. bulk density

Mean log₁₀(S)



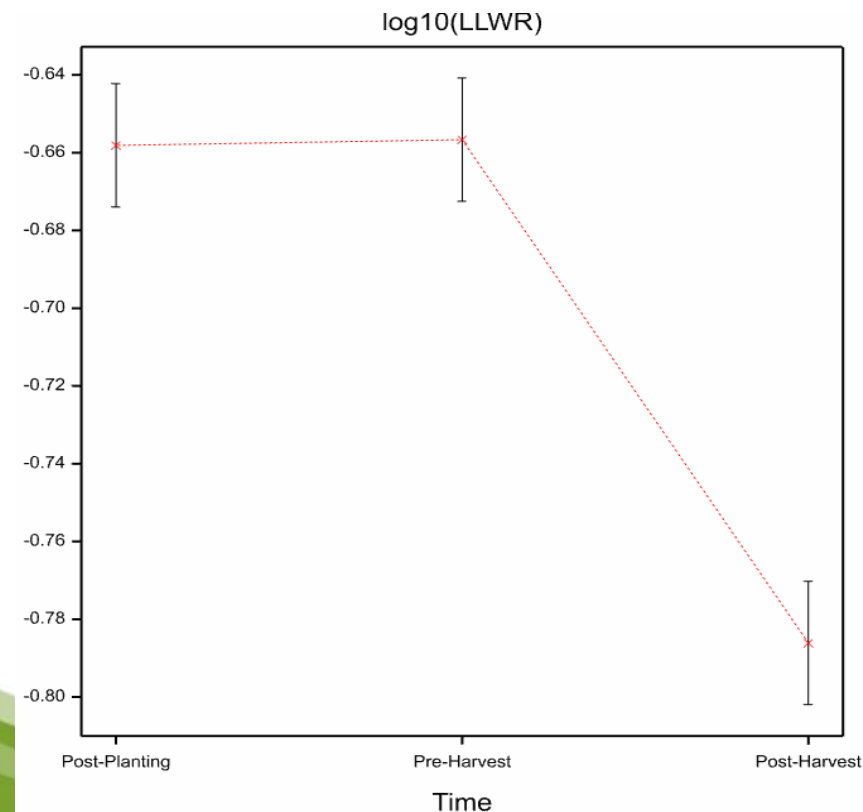
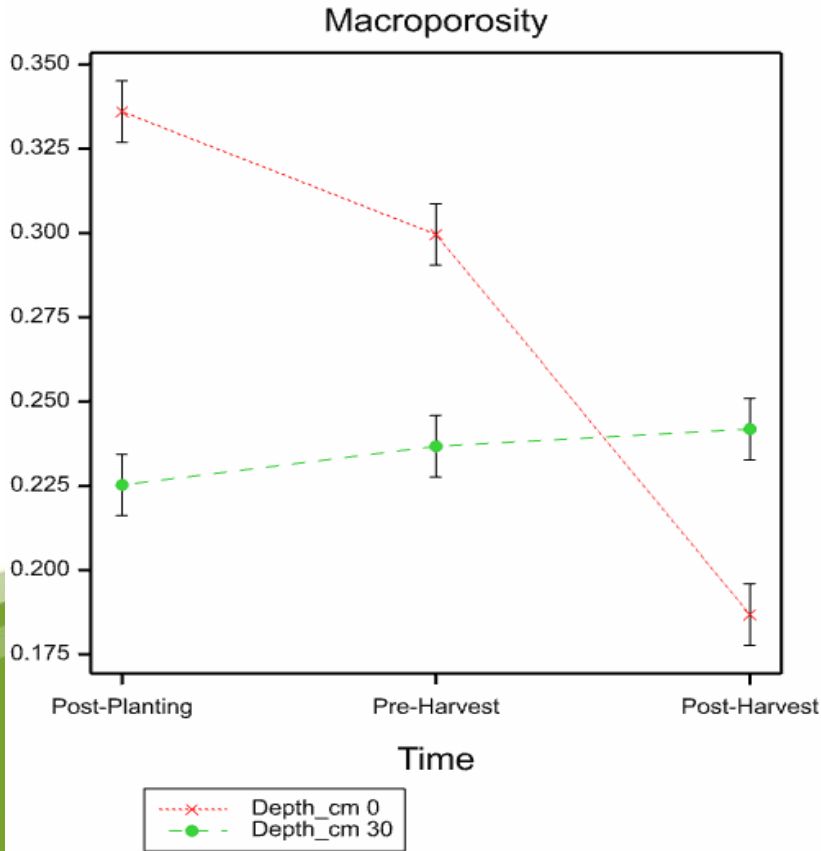
Mean log₁₀(S)



Post-planting to pre-harvest & post-harvest

At surface: loss of macroporosity and soil strength increases (decreasing LLWR).

At depth little change.



Harvest effects

Loss of macroporosity at surface associated with harvest

No real changes at 30 cm depth associated with harvest – why?

CSC has large stone (up to 40%) content below topsoil.

Cultivation depth in both managements is constrained.

Hutton potato harvester is < 6 Mg total load and 3 Mg wheel load.



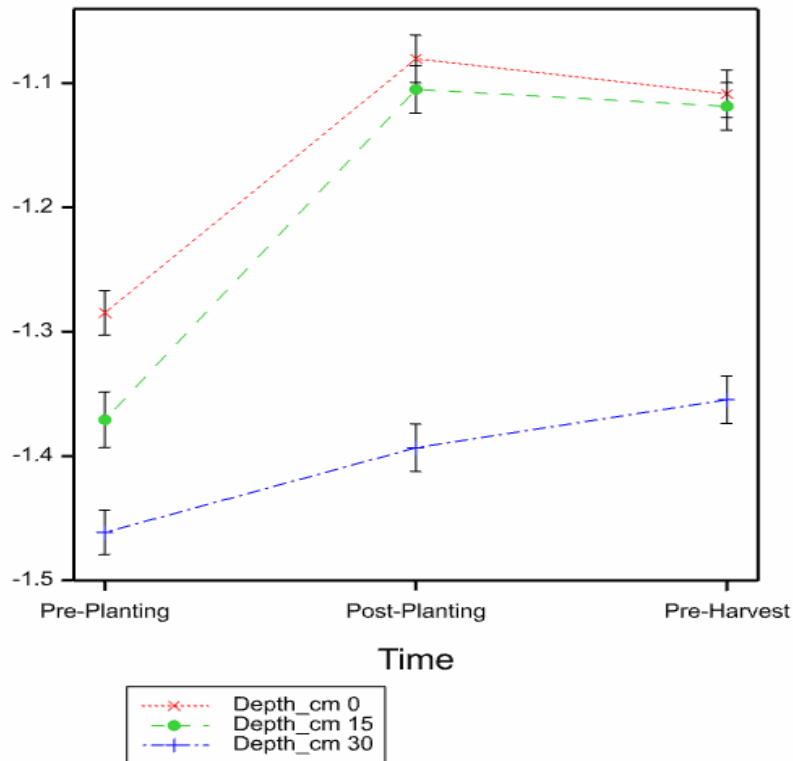
Pre-planting, post-planting & pre-harvest

i.e. what changes due to planting potatoes

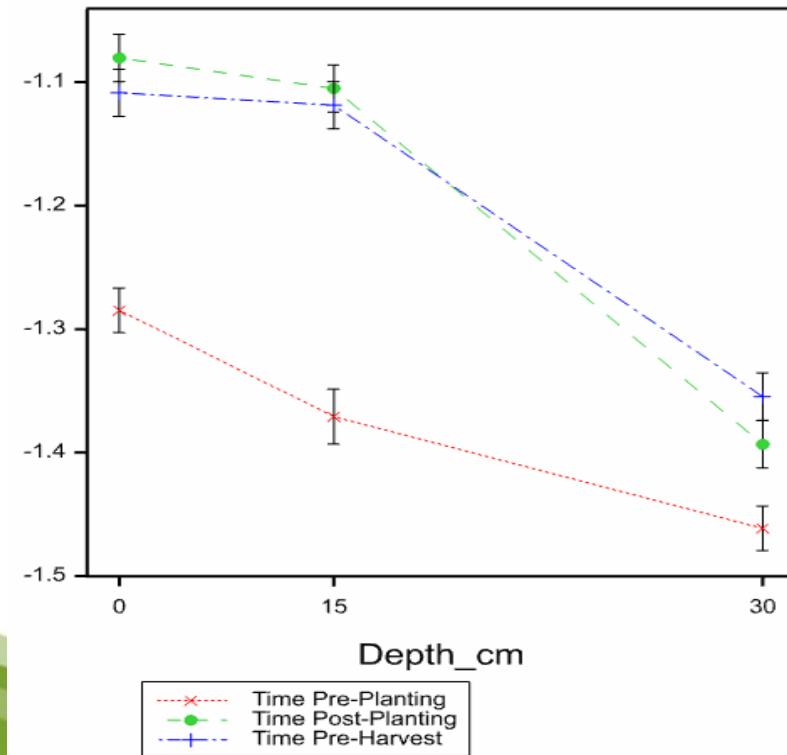
Tillage with planting is just down to 30 cm

“S”: not different with soil management

Mean log₁₀(S)



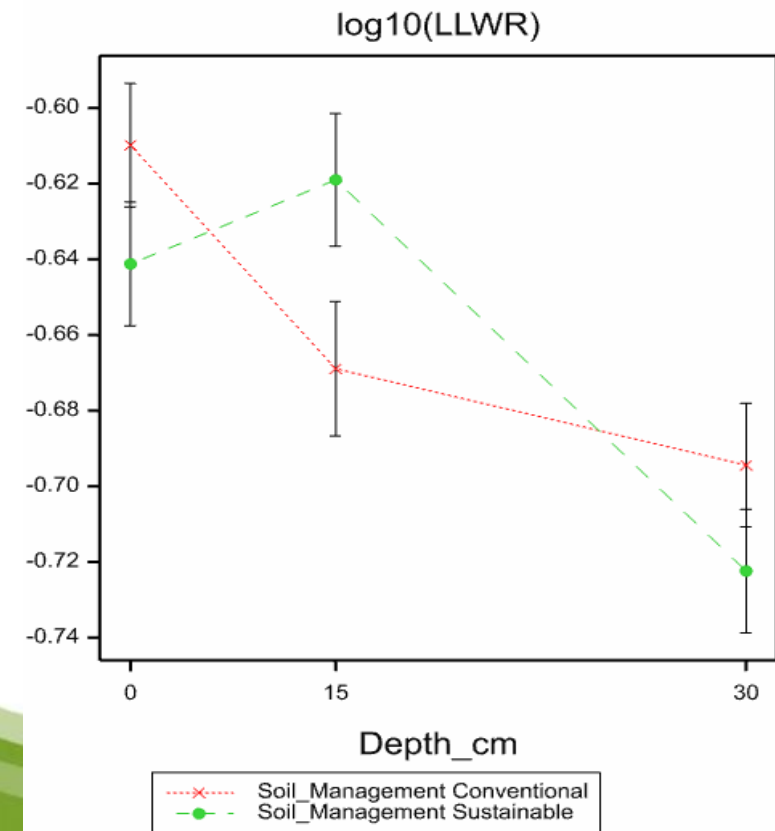
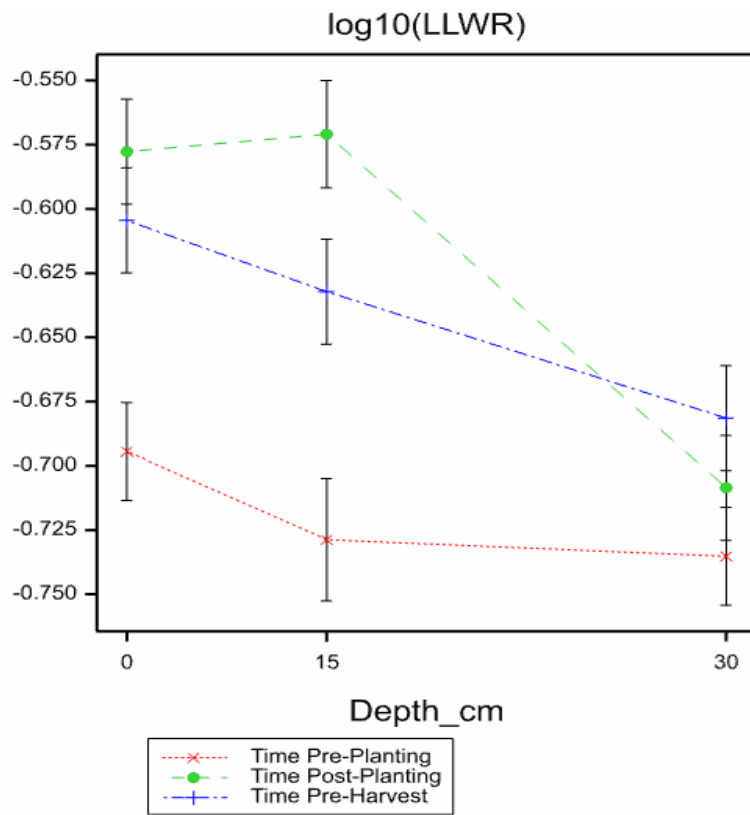
Mean log₁₀(S)



Pre-planting, post-planting & pre-harvest

LLWR: depth & time of sampling significant

Interaction soil management x depth significant which is likely to be linked to soil strength (hardness)



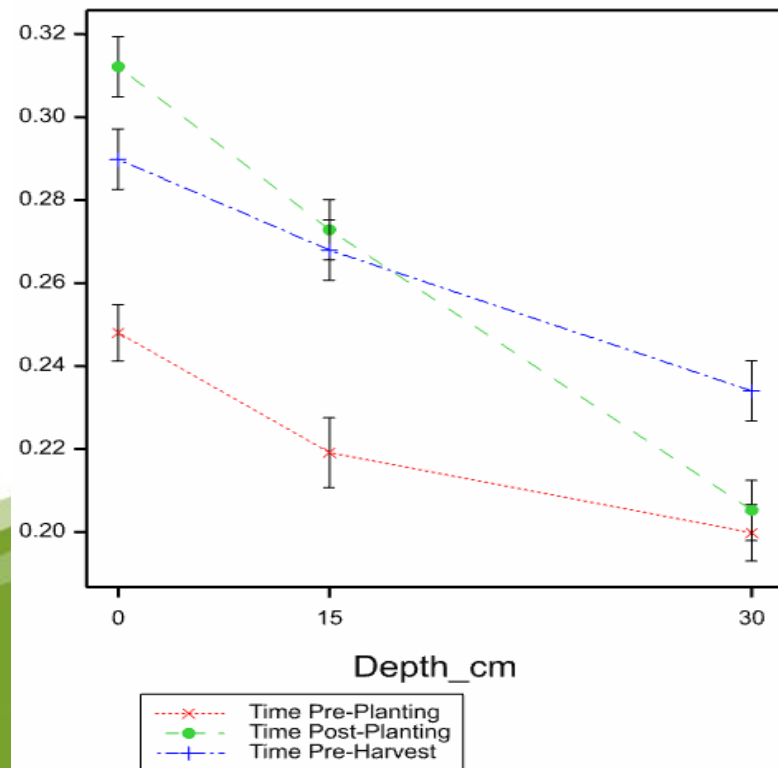
Pre-planting, post-planting & pre-harvest

Macroporosity greatest at the surface

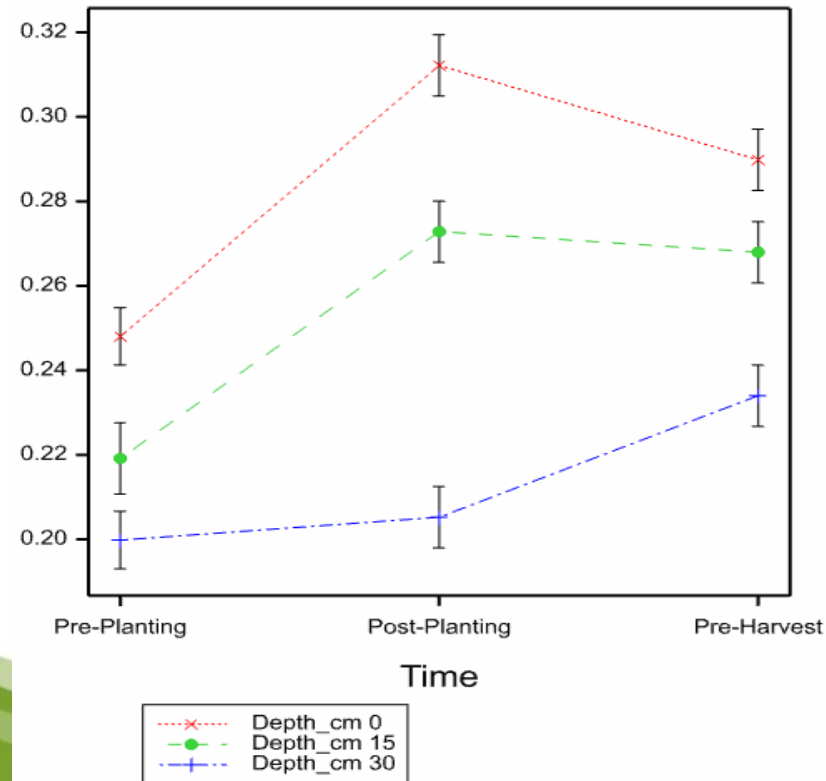
Increase in macroporosity with bed formation that (largely) persisted

No soil management effects

Macroporosity



Macroporosity



Pre-planting, post-planting & pre-harvest



Soil conditions following planting have few differences with soil management.

Interactions e.g for LLWR may be related to amelioration associated with the compost.

Terranimo UK












www.terranimodk.dk – Now has UK button

Updated machinery/tyre options. Are we missing anything?

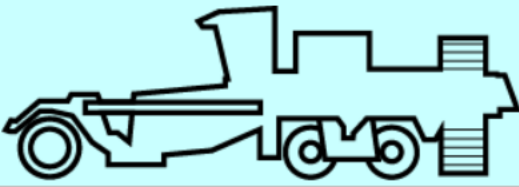
On-going AHDB supported work to get better links to UK soils data.

Select machine


-  330 HP tractor
-  170 HP tractor
-  90 HP tractor


-  Combine harvester
-  Forage harvester
-  Beet harvester
-  **Potato harvester**
-  Self-propelled sprayer
-  Slurry spreader


Potato harvester





Click tyre icon to change tyre
Hold mouse over a tyre icon or axle icon to see specification




















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Site information

Tillage Yes (only if recently ploughed) No

Soil texture

Automatic by soil type Manual texture

Select soil type

- ABERDEENSHIRE
- ABERDEENSHIRE
- ANGUS
- AYRSHIRE
- BORDERS
- DUMFRIES
- FIFE
- HIGHLAND
- LOTHIANS
- MORAY
- PERTH & KINROSS

No.	Bottom [cm]	Moisture [%]	Silt [%]	Sand [%]	Organic matter [%]	Bulk density [g/cm ³]
1	30	3.0	47.3	49.7	4.2	1.08
2	40	4.4	43.1	52.5	4.0	1.19
3	50	3.1	20.5	76.4	0.6	1.52
4	60	3.2	19.2	77.6	0.1	1.89
5	70	3.2	19.2	77.6	0.1	1.89
6	80	3.2	19.2	77.6	0.1	1.89
7	90	3.2	19.2	77.6	0.1	1.89
8	100	3.2	19.2	77.6	0.1	1.89
9	110	3.2	19.2	77.6	0.1	1.89
10	120	3.2	19.2	77.6	0.1	1.89
11	130	3.2	19.2	77.6	0.1	1.89
12	140	3.2	19.2	77.6	0.1	1.89
13	150	3.2	19.2	77.6	0.1	1.89

Soil water

Automatic by wetness Manual matric potential

Select wetness

- Moist

No.	Bottom [cm]	Matric potential [hPa]
1	10	10
2	20	10
3	30	10
4	40	10
5	50	10
6	60	10
7	70	10
8	80	10
9	90	10
10	100	10
11	110	9
12	120	8
13	130	7
14	140	6
15	150	5

Reset soil and water to default



Conclusions

With caution: properly managed potato crops grown in good conditions are not making soil conditions significantly worse.

Some differences (improvements) in soil conditions that are associated with compost addition.

Soil in the CSC while shallow is generally stable and “well structured” and the stone content at depth may be limiting compaction problems.

Terranimo (UK) identifies soils, machinery and conditions that may place soils at risk of severe compaction to depth.

Acknowledgements



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James Hutton Farm staff



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