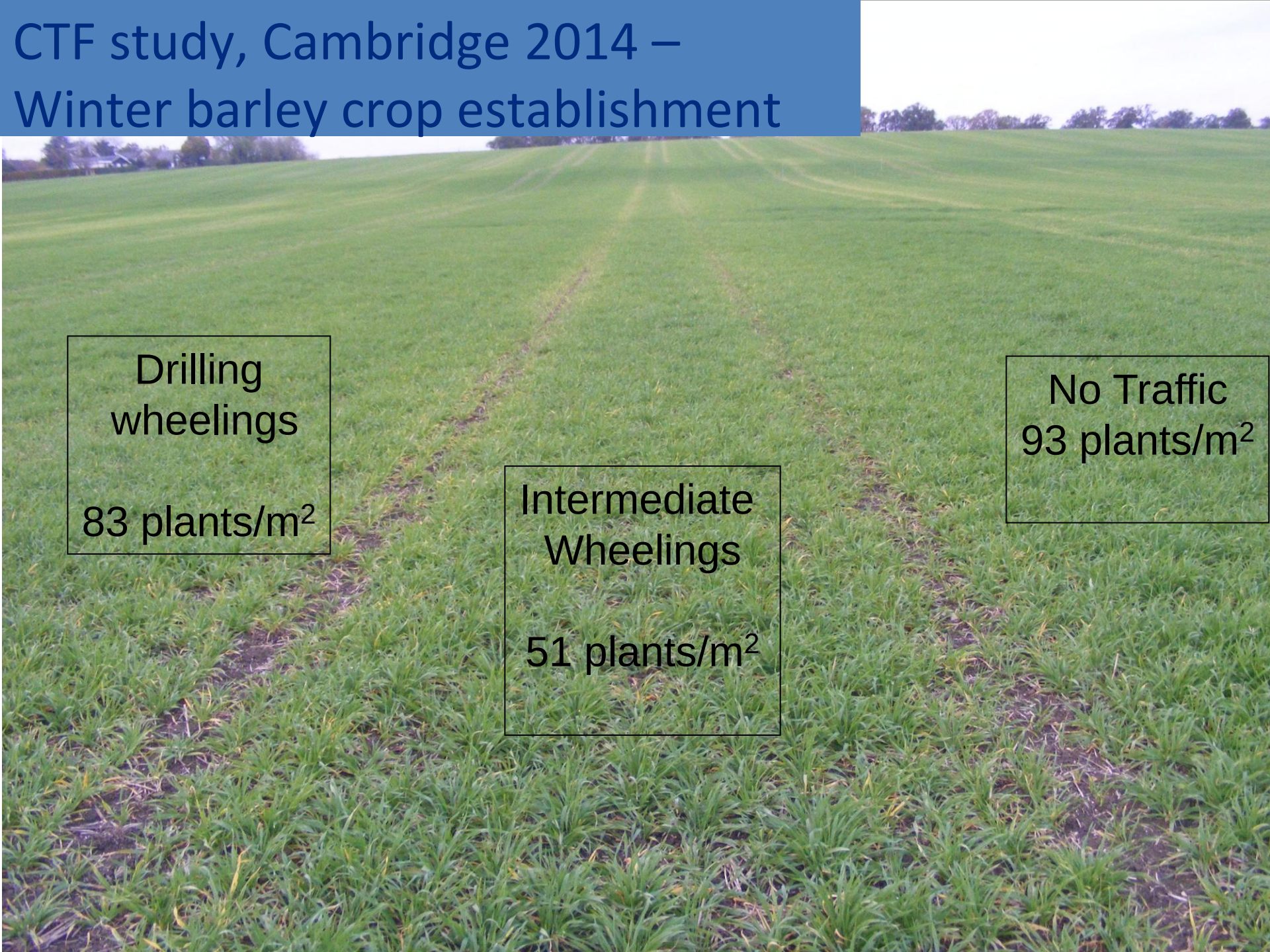
Controlled Traffic Farming study

- Aim – To examine the impact on soil structure and crop responses during the transition to a CTF system in a commercial field situation

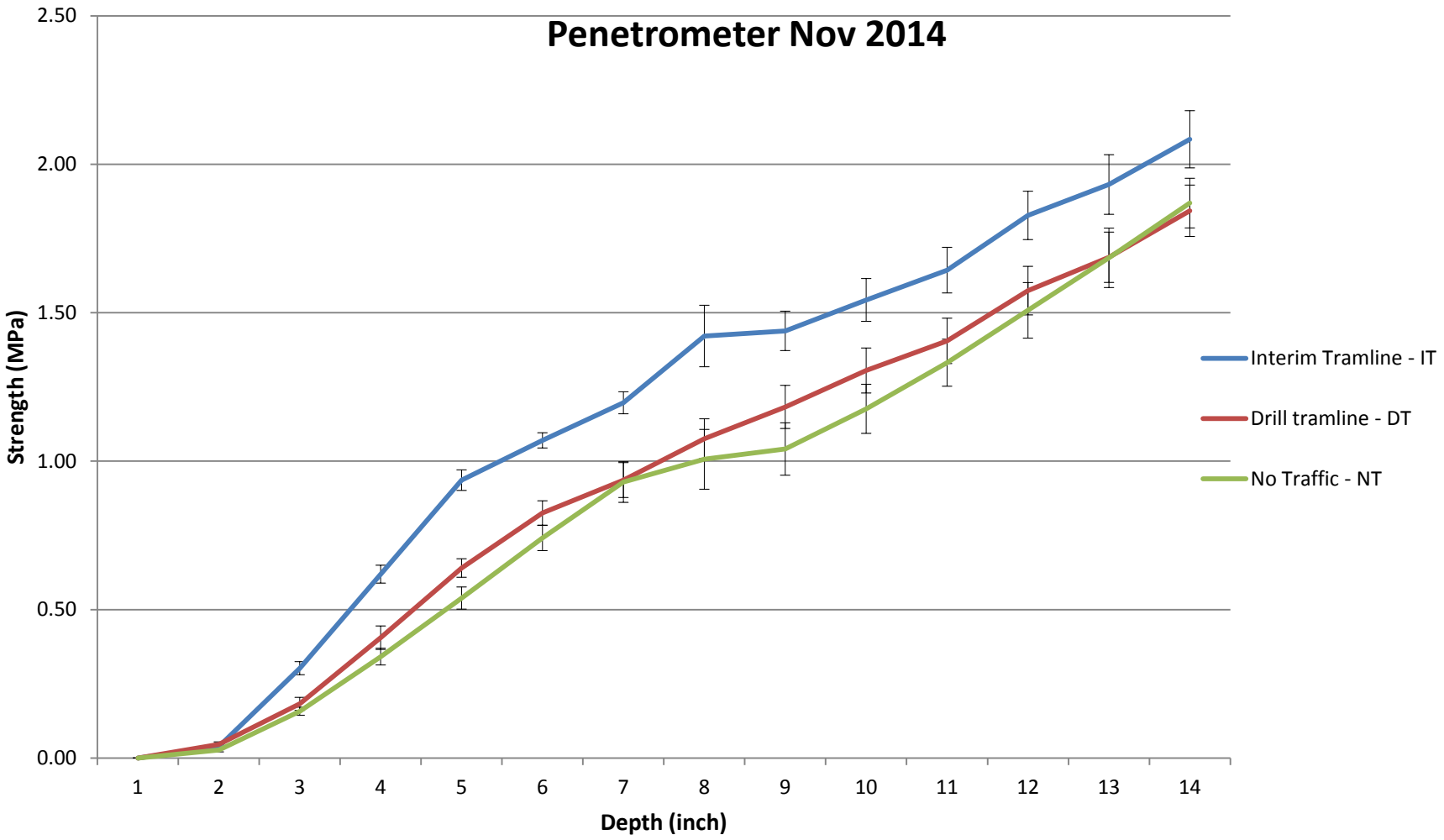
- Identified three areas of trafficking; No traffic (NT), Drill tramline (DT), Interim tramline (IT).

- We will examine the impact of differing levels of trafficking on:
  - Soil structure
  - Soil recovery
  - Soil function
  - Crop growth

CTF study, Cambridge 2014 – Winter barley crop establishment

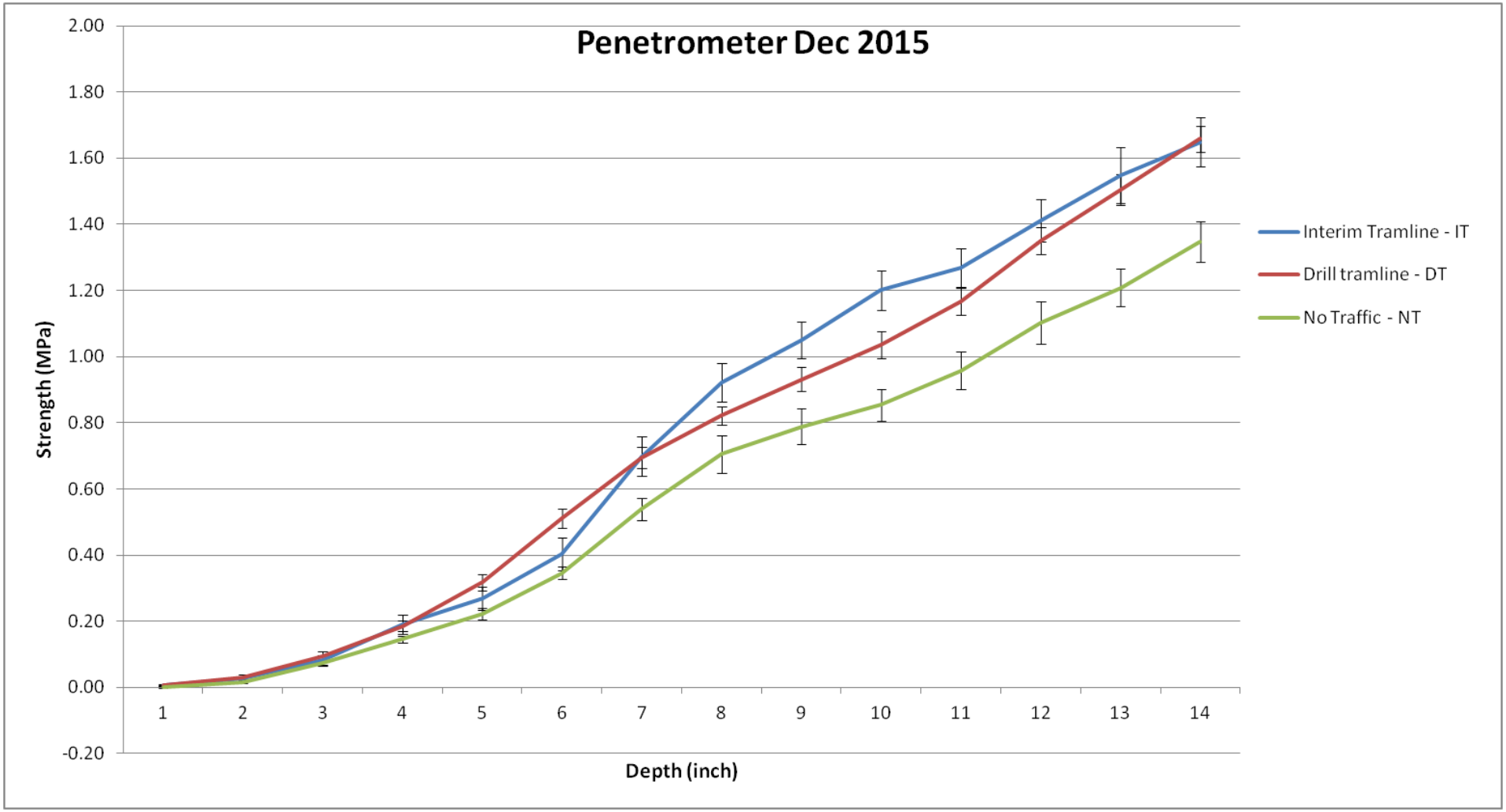


Cambridge - Soil strength under three intensities of field trafficking – 2014



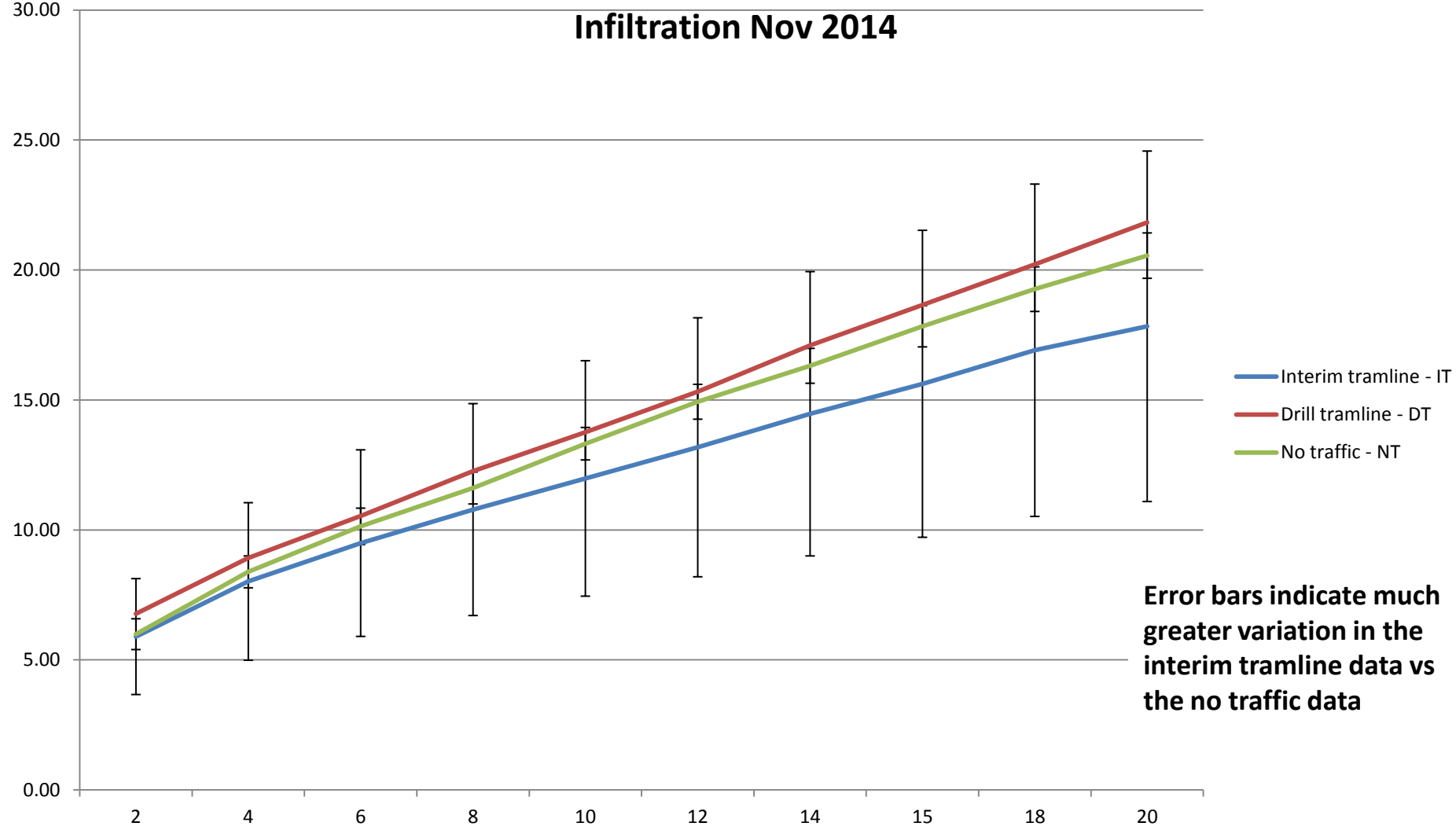
Error bars are the standard error of the mean

Cambridge - Soil strength under three intensities of field trafficking – 2015



Error bars are the standard error of the mean

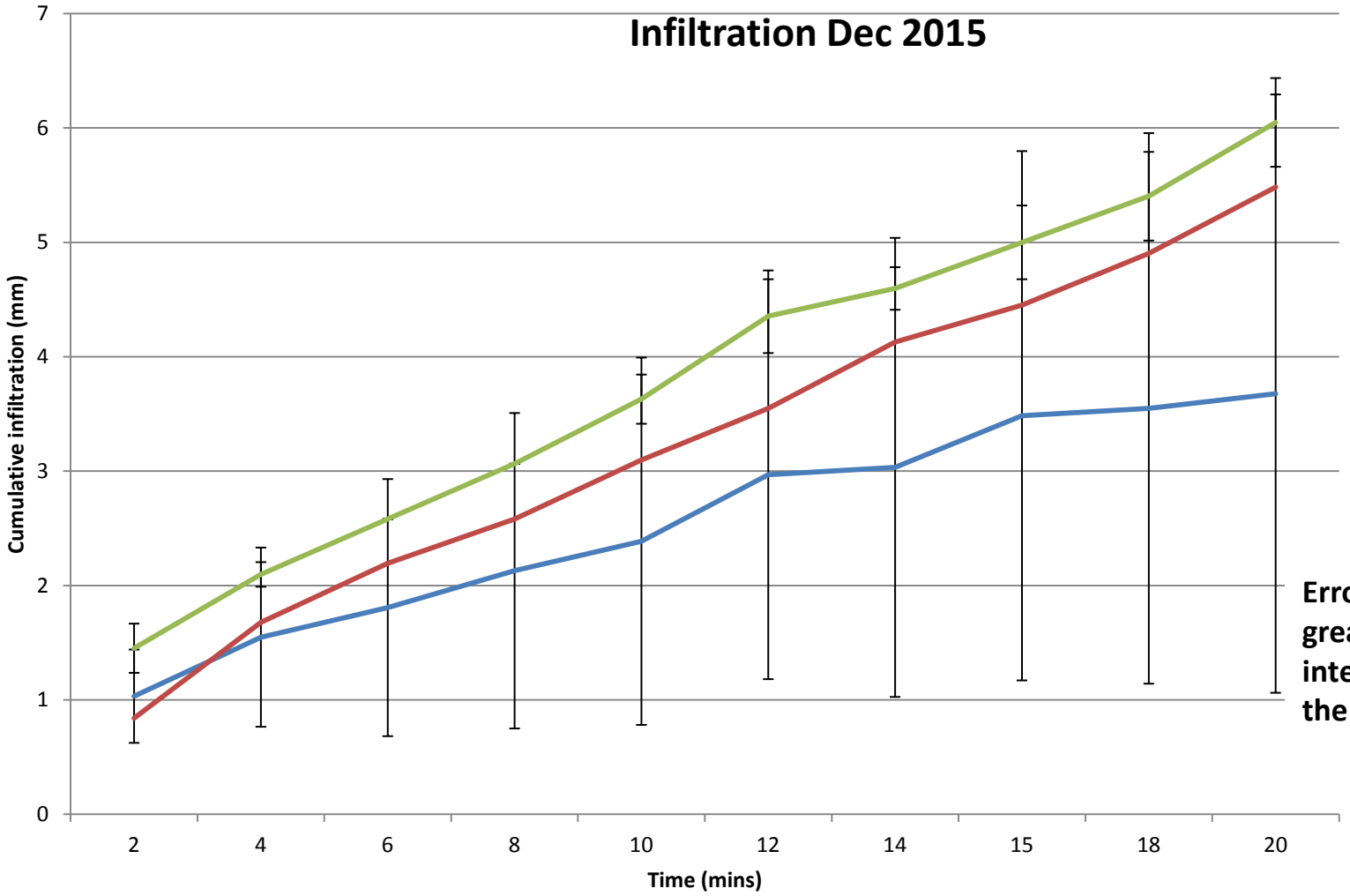
Cambridge - Soil infiltration under three intensities of field trafficking – 2014



Error bars indicate much greater variation in the interim tramline data vs the no traffic data

Error bars are the standard error of the mean

Cambridge - Soil infiltration under three intensities of field trafficking – 2015



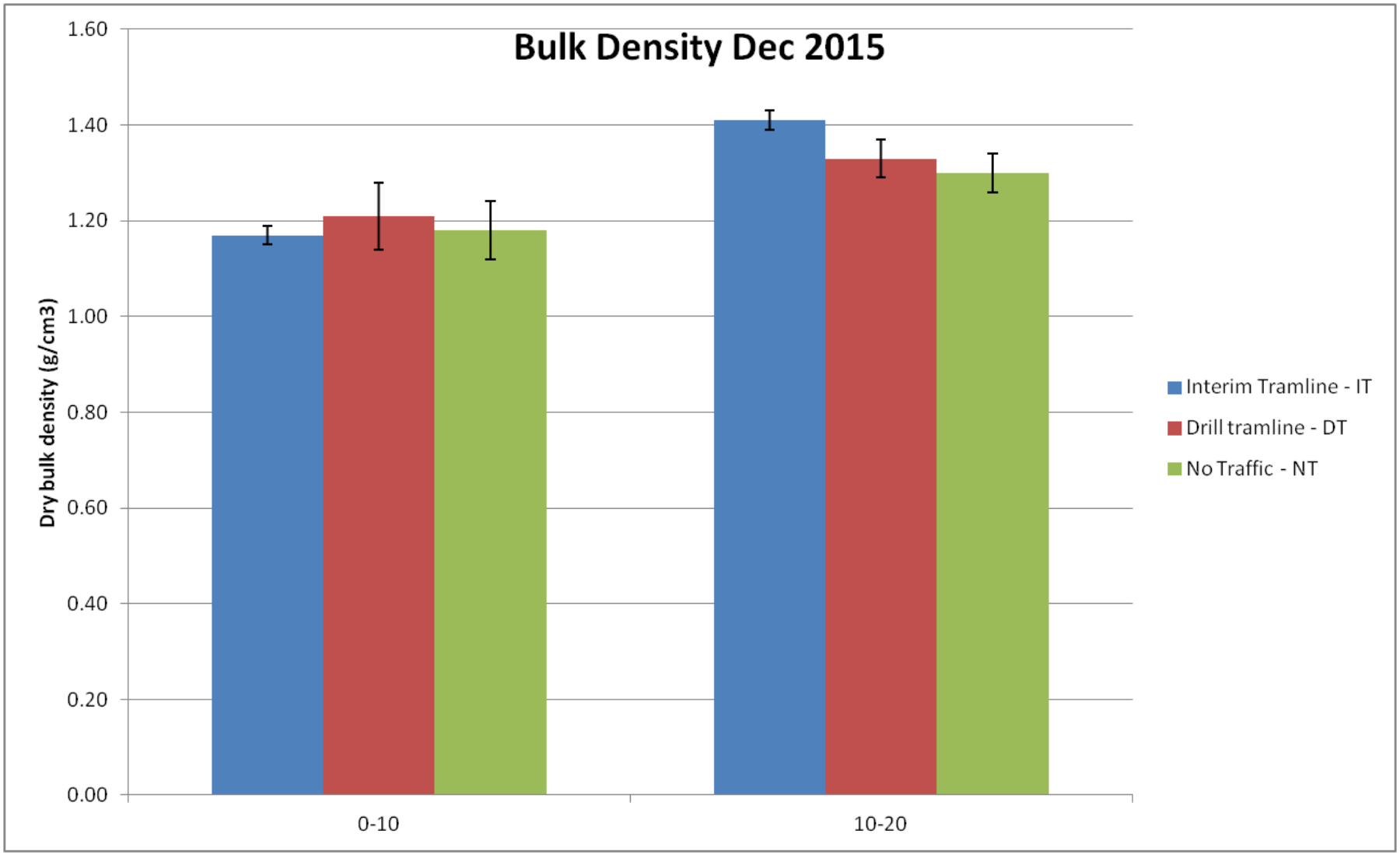
Error bars indicate much greater variation in the interim tramline data vs the no traffic data

Error bars are the standard error of the mean

Relationship of soil bulk density to root growth (Adapted from: Brady and Weil, 2007)

Soil texture	Ideal bulk densities for plant growth (g/cm^3)	Bulk densities that affect root growth (g/cm^3)	Bulk densities that restrict root growth (g/cm^3)
Sands, loamy sands	< 1.60	1.69	> 1.80
Sandy loams, loams	< 1.40	1.63	> 1.80
Sandy clay loams, clay loams	< 1.40	1.60	> 1.75
Silt, silt loams	< 1.40	1.60	> 1.75
Silt loams, silty clay loams	< 1.40	1.55	> 1.65
Sandy clays, silty clays, clay loams	< 1.10	1.49	> 1.58
Clays (>45 %)	< 1.10	1.39	> 1.47

Cambridge - Soil bulk density under three intensities of field trafficking – 2015



Error bars are the standard error of the mean

Cambridge - Soil structure assessment (VESS) under three intensities of field trafficking in 2014/2015 seasons

Interim Tramline
3.0/3.5

Drill tramline
3.0/3.0

No traffic
2.5/2.5

Random traffic vs CTF

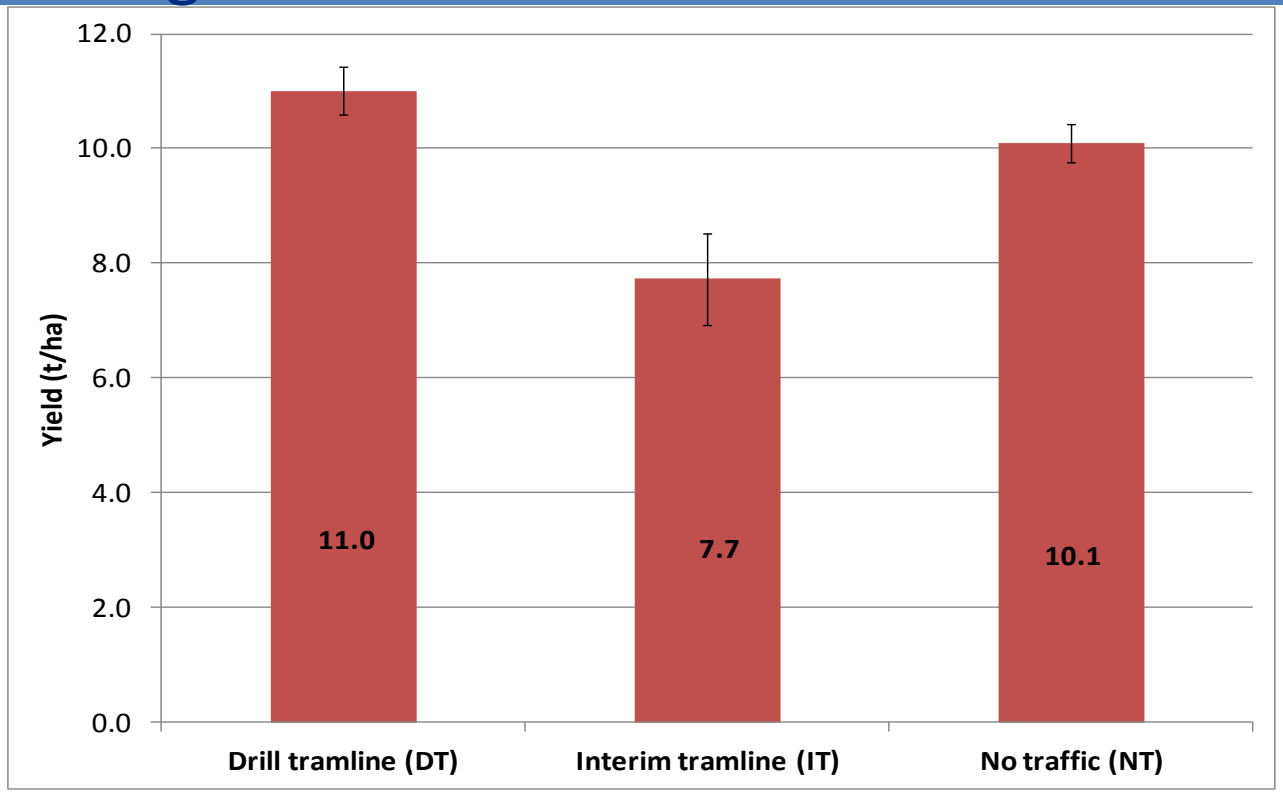
Random traffic example (assuming 750mm tyres):
50% = 1 pass with 3m cultivator with 1.5m wheelings
25% = 1 pass with 6m discs with 1.5m wheelings
38% = 1 pass with 4m cult drill with 1.5m wheelings

Total = ~110% + additional harvest traffic

CTF based on 36m tramlines (assuming 750mm tyres):
Intermediate tramline = 12% of field area
every 12m with 1.5m wheelings

No traffic = 88% of field area

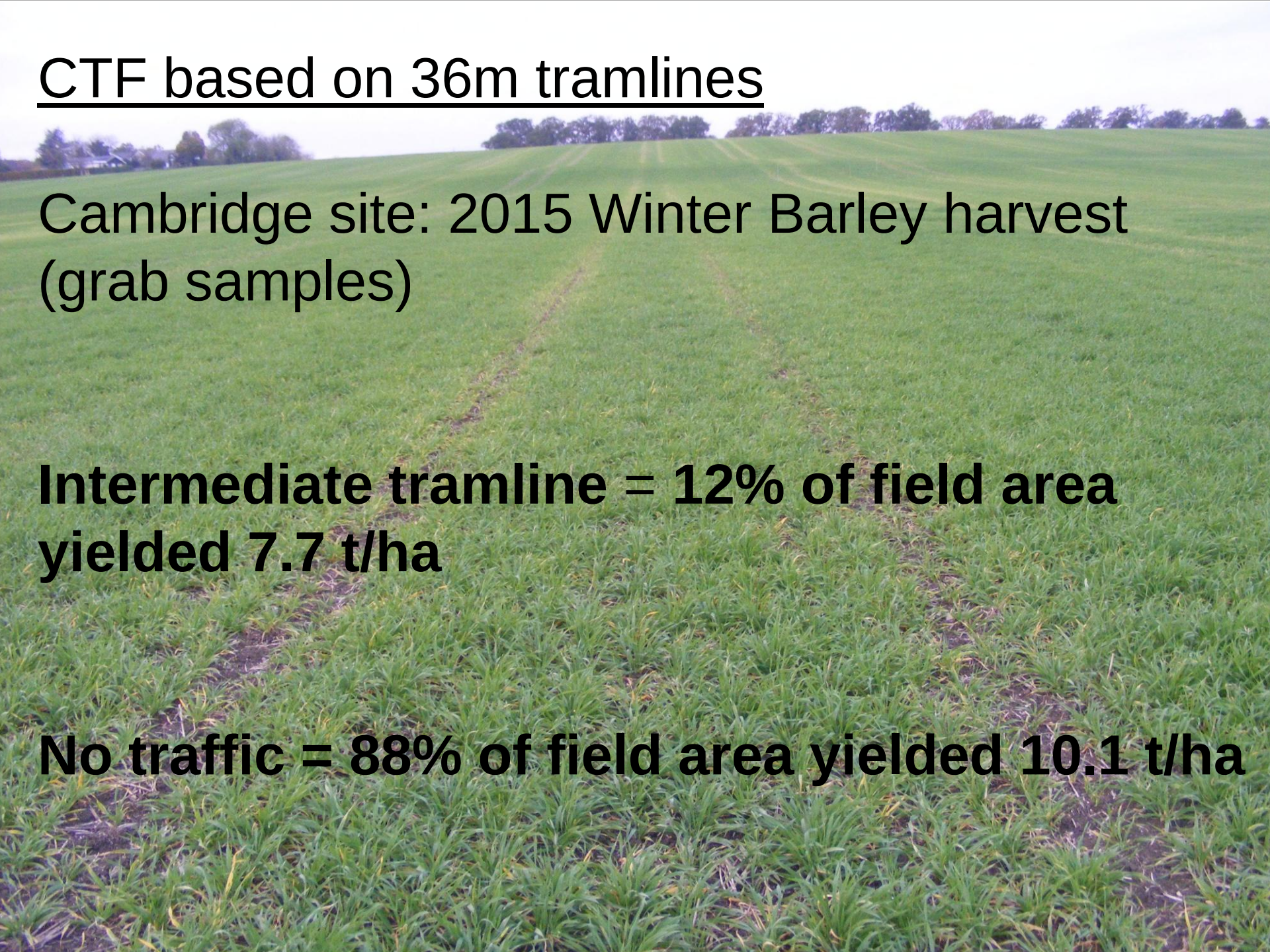
Harvest 2015, Winter barley yields under three intensities of field trafficking



Trafficking	Relative yield (%)
No traffic (NT)	100
Drill tramline (DT)	108
Interim tramline (IT)	75

Error bars are the standard error of the mean

CTF based on 36m tramlines



Cambridge site: 2015 Winter Barley harvest (grab samples)

Intermediate tramline = 12% of field area yielded 7.7 t/ha

No traffic = 88% of field area yielded 10.1 t/ha

Mustard plant counts 10.6.16

	Plant counts m^2
Interim tramline	35
Drill tramline	39
No traffic	46

Summary

- Soil structure and crop establishment measurements over two consecutive years consistently indicated that the areas with no traffic had increased plant numbers and rates of water infiltration, and lower soil strength and bulk density compared to the drill tramline and interim tramline measurements.

- Drill tramlines (single pass) tended to have better crop and soil properties compared to the interim tramlines (multiple passes).

- Even a single pass with farm equipment caused a tighter soil structure to an extent to which negative impacts on crop yield were found.

- It is important to note that yield data was collected in a relatively crude manner of hand grab samples and therefore exact yield figures should be treated with caution. However, the relative differences found between the different areas of trafficking are of value.