



# What's all the fuss about soil carbon?

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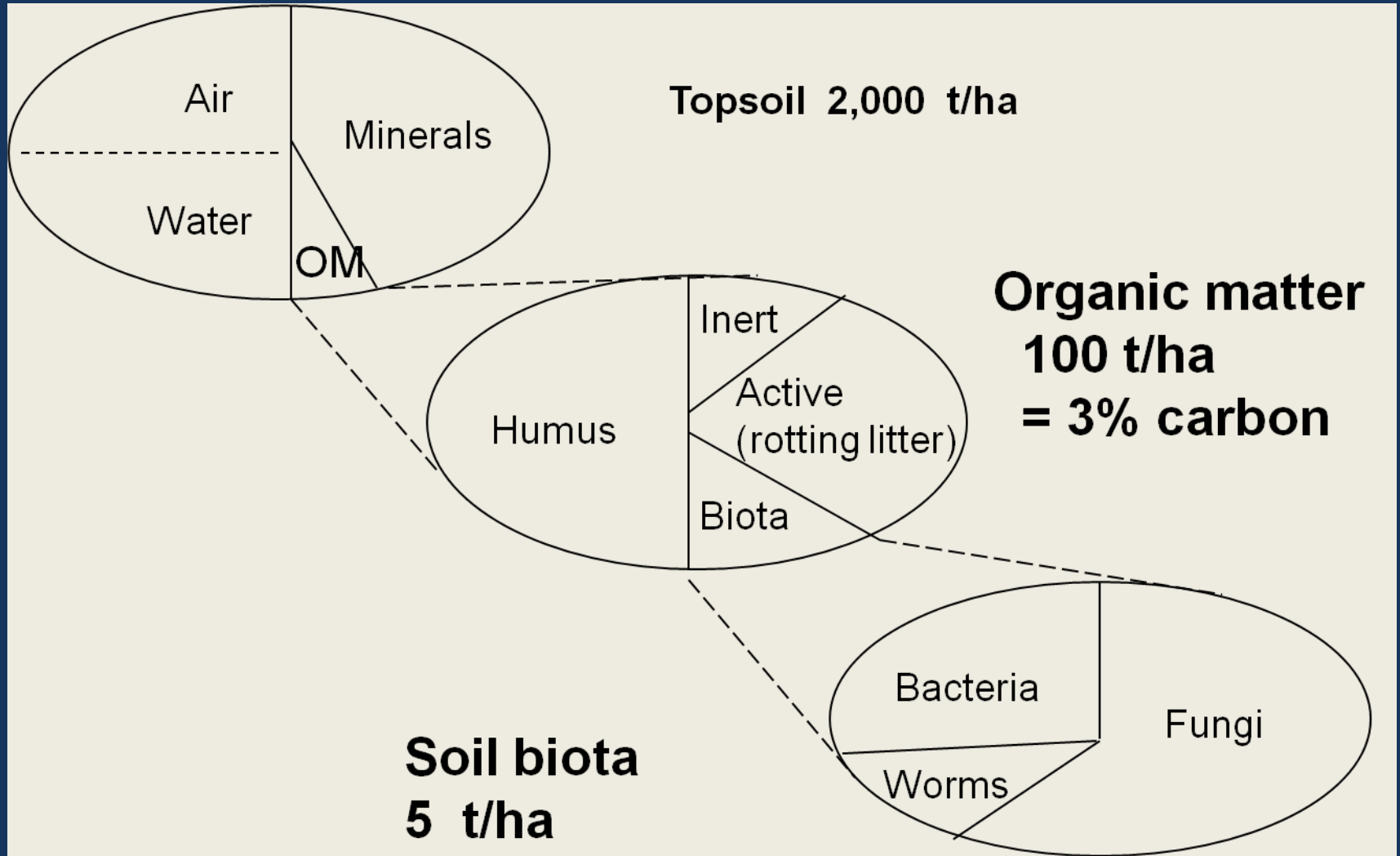


# What is Soil Carbon?

- It is the measure of the non living organic matter present in the soil



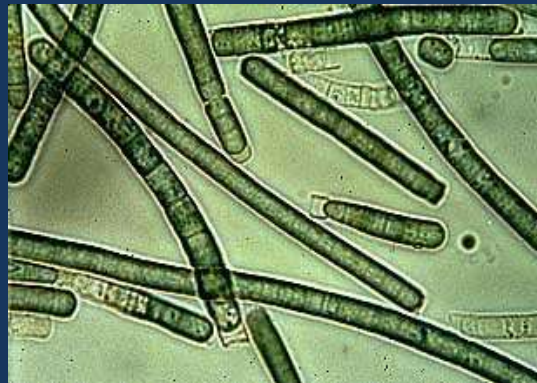
# Soil Organic Matter



Source: Bill Cotching (TIAR)

# Why is it important?

- Physical - soil structure, water holding capacity, aeration & soil temperature
- Chemical – major source of cation exchange capacity (CEC), pH buffering, binding site for pesticides & heavy metals
- Biological - Food source for soil fauna & major reservoir of plant nutrients



# How is Organic Carbon affected?

- Climate

eg. Rainfall & Temperature

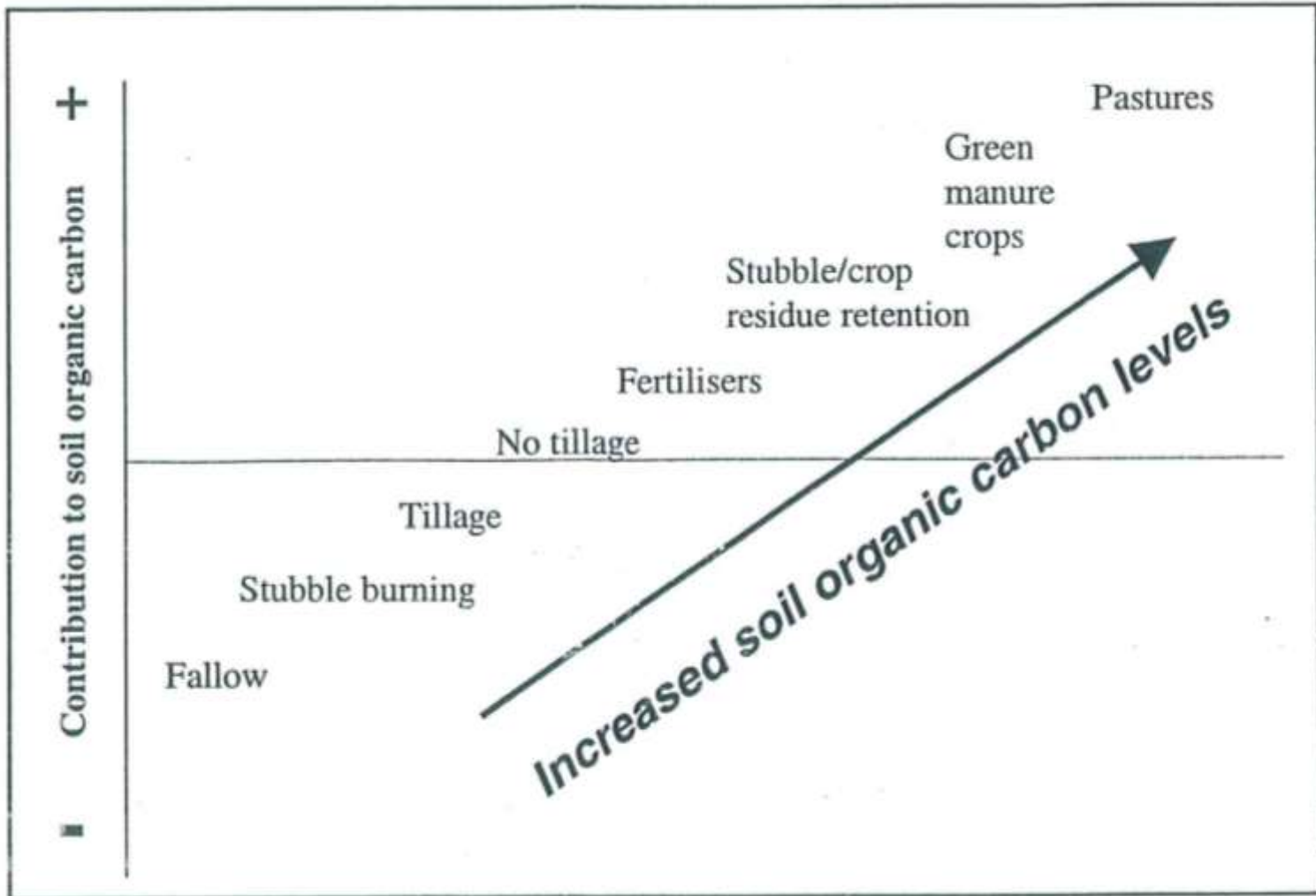
- Soil Type

- Management

eg. tillage, weed management,  
crop rotation & fertilizers



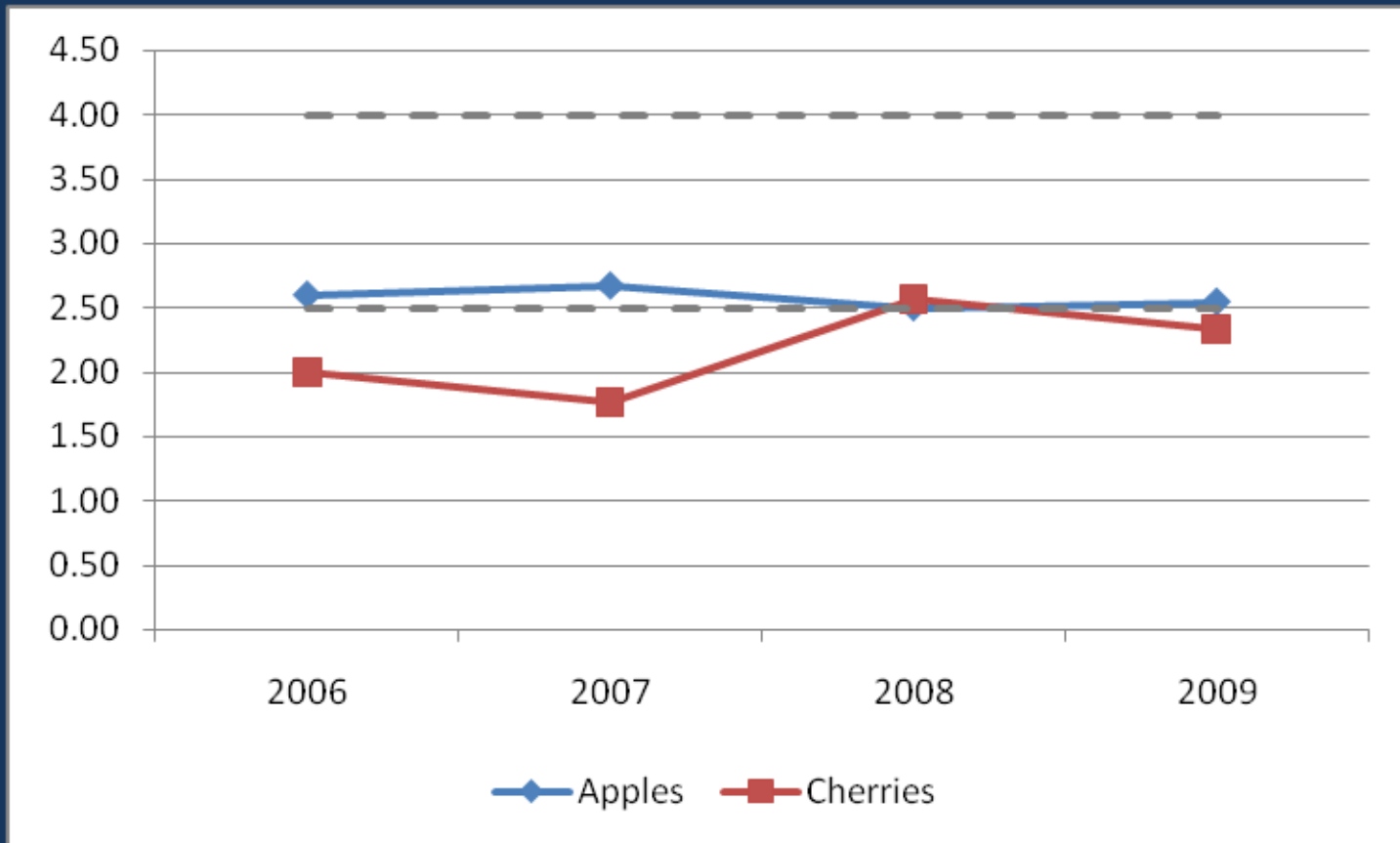
# How is Organic Carbon affected?



# How much should I have?

- Recommended Organic Carbon range is 2.5 – 4 %

Apples & Cherries - average Organic Carbon (%) 2006-09 (Agvita Analytical)



# What can I do about it?

- Use practices that minimise losses
  - Minimise bare ground & reduce herbicide applications
  - Side throwing mowers
  - Mulch prunings
- Grow roots
  - Living mulches or cover crops
- Add using amendments
  - Mulches
  - Eg. compost, straw, other waste materials





Living mulches, cover or companion crops

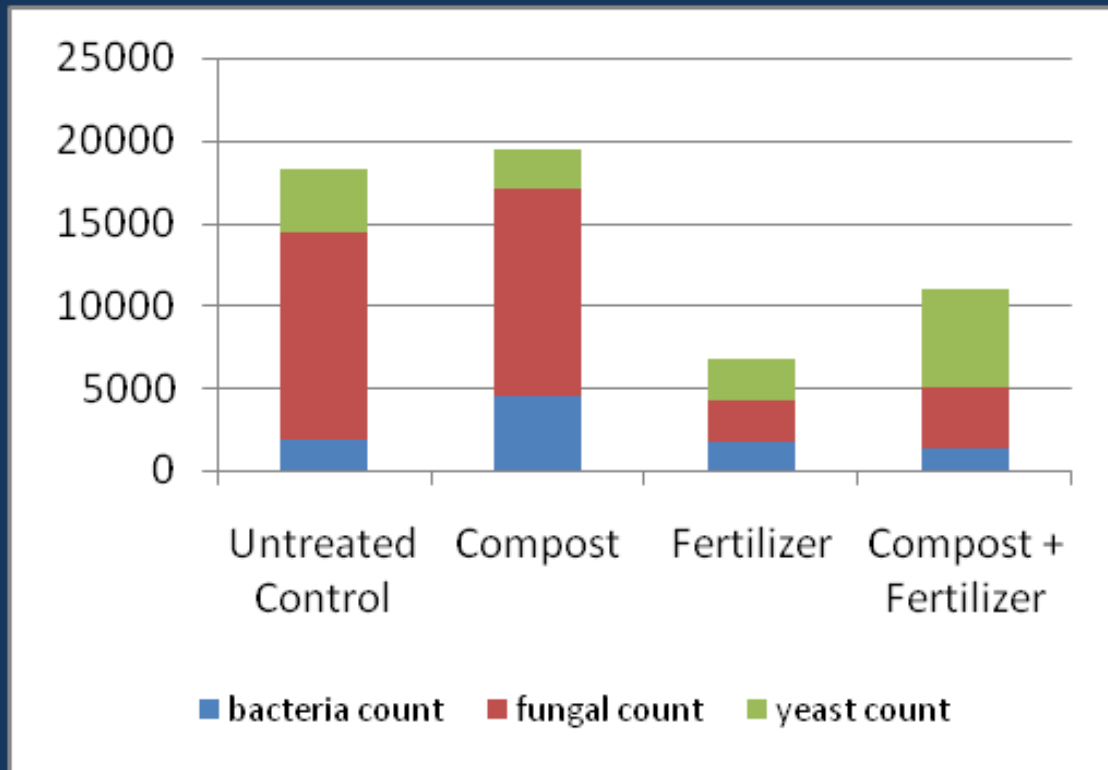


Compost, straw & waste materials



# Apple Compost Trial

Site 2 – Soil Microbes (Kg/ha) March 09 (Sandy Loam)



# Mulches in Orchards



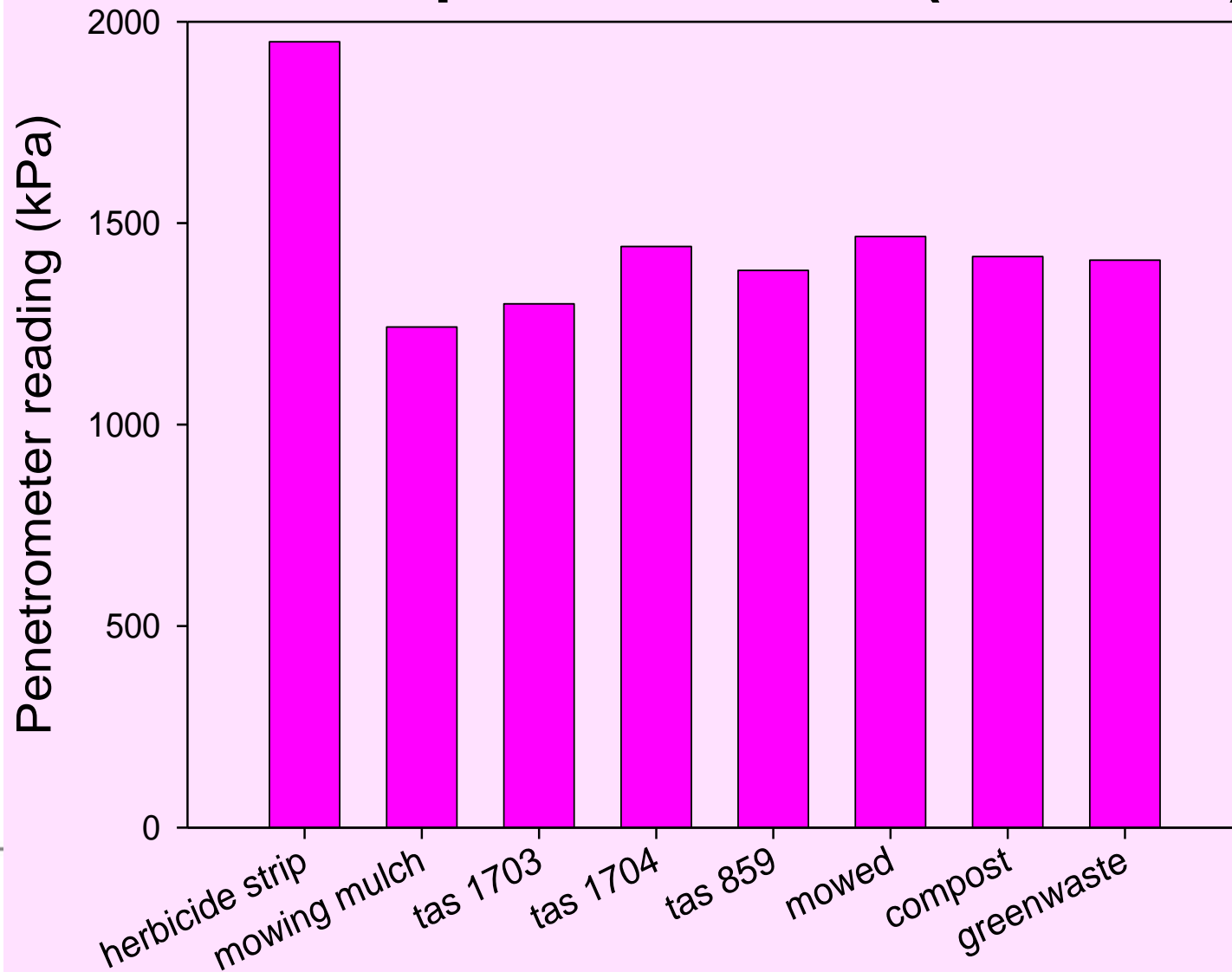
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## Soil Organic Matter at Site 1 (Pink Lady)

Treatment	Estimated Organic Matter %	
Bare Earth	8.0	a
Mowing Mulch	9.3	ab
Cocksfoot - <i>Dactylis glomerata</i> (Tas 1703)	8.2	a
Cocksfoot - <i>Dactylis glomerata</i> (Tas 1704)	8.4	a
Fescue - <i>Festuca ovina</i> (Tas 859)	8.0	a
<b>Bark</b>	<b>14.1</b>	<b>bc</b>
<b>Bark &amp; Fish Waste</b>	<b>16.2</b>	<b>cd</b>
<b>Composted + shredded green waste</b>	<b>20.1</b>	<b>d</b>
Hemp straw	10.0	ab
Weedmat	8.6	a



# Soil compaction - Site 2 (Nov 2004)

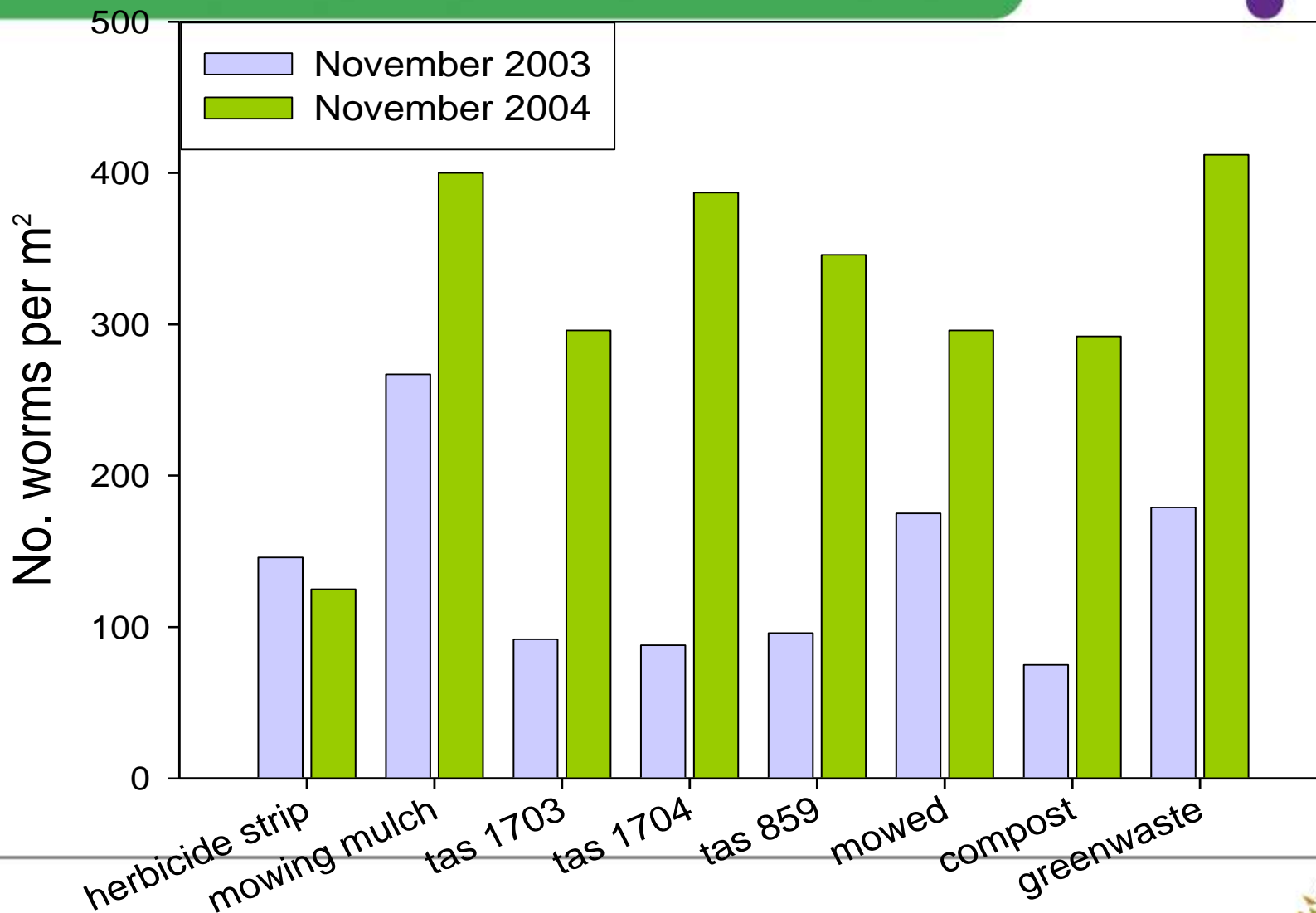


# Worm numbers

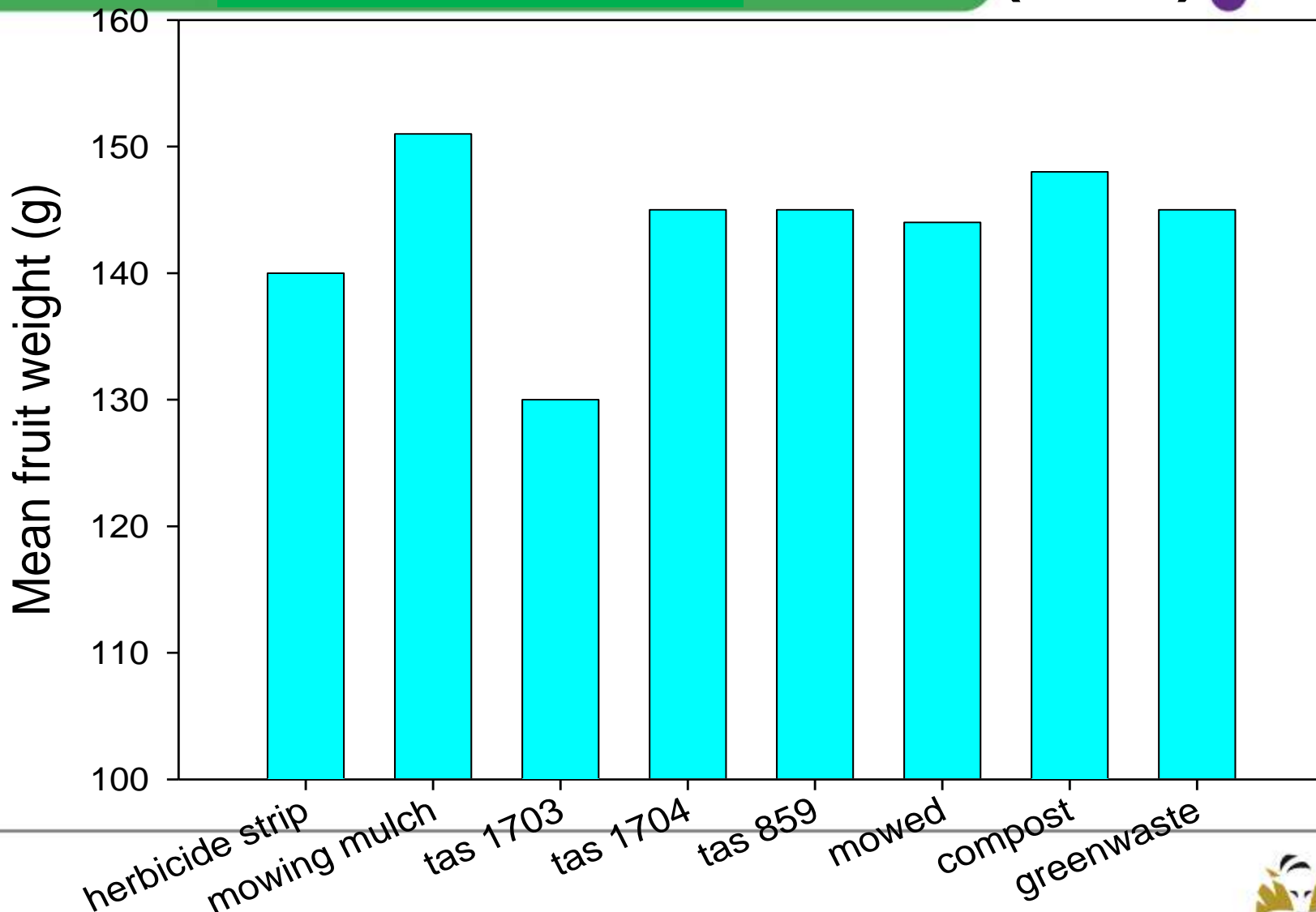
- Site 2



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# Fruit weight - Site 2 (Gala)



# Mulch & ground cover in orchards



- Improves soil life
- Reduces compaction
- Increases infiltration
- Adds organic matter to the soil
- Improves soil structural stability

A groundcover can slow down surface water flow, and so reduce soil erosion

# Effect of Wood wastes on water infiltration rate

Treatment	After 1 year	After 3 years
Weed free strip	No penetration to 20 cm after 2 hr	No penetration to 20 cm after 2 hr
Wood chip fines	No penetration to 20 cm after 2 hr	Penetration to 20 cm after 1 hr Penetration to 30 cm after 2 hr
Composted sawdust	Penetration to 20 cm in 1 min No penetration to 30 cm after 2 hr	Penetration to 20 cm after 1 min Penetration to 30 cm after 2 min

Source: *Wayne Boucher*

# How much do I need to apply?

Organic Carbon (t/ha) = Depth (cm) x Bulk density (g/cm<sup>3</sup>) x Soil Carbon content %



## Increase Organic Carbon from 2% - 4% in 5 years?

- 24 t C/ha =  $10\text{cm} \times 1.2 \text{ g/cm}^3 \times 2 \%$
- 48 t C/ha =  $10\text{cm} \times 1.2 \text{ g/cm}^3 \times 4 \%$
- Need to add 24 t carbon to the soil
- Plant residues contain 45% Carbon = 50 t / ha DM
- Over 5 years = 10 t DM per year assuming no decomposition
- Approx 50% of plant residues added will decompose
- Therefore need to add 20 t DM /ha/ year for 5 years



# Conclusion

- Monitor your soils
- Minimise losses as it take a lot to increase OC
- Evaluate amendments carefully  
eg. costs, transport & ease of application, free of weeds

