



Food Research



Plant & Food  
**RESEARCH**

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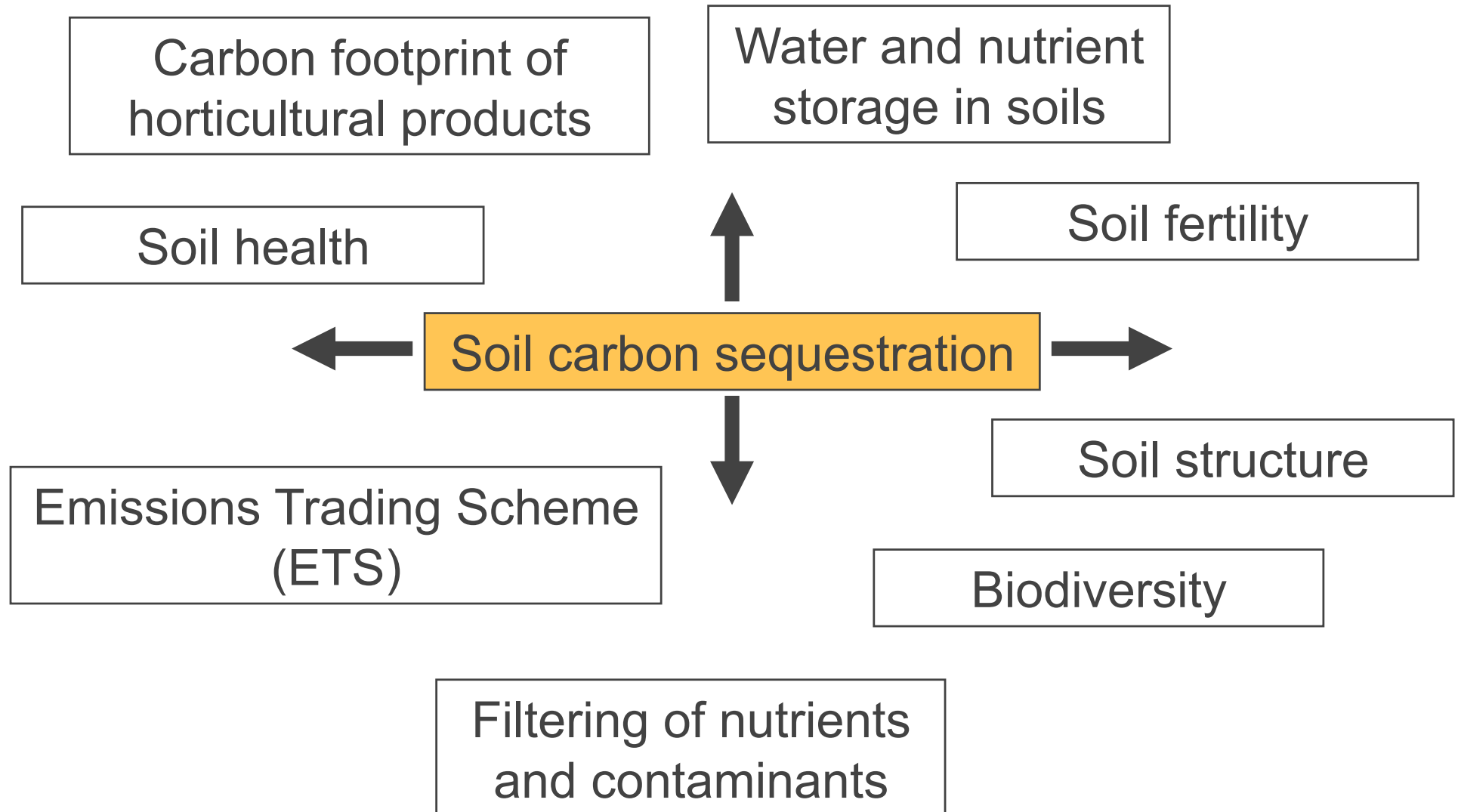
# Quantifying soil carbon sequestration in kiwifruit orchards – Development of a sampling strategy



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# Why do we bother?



# Objectives

## SFF on carbon sequestration in kiwifruit orchards

- Orchardists, PlusGroup, Plant&Food Research, ZESPRI  
(*COST = Carbon in Orchards Soils Team*)
  - Robust method to quantify soil carbon sequestration
  - Survey carbon sequestration in major growing regions

## Soil carbon in kiwifruit orchards: Questions

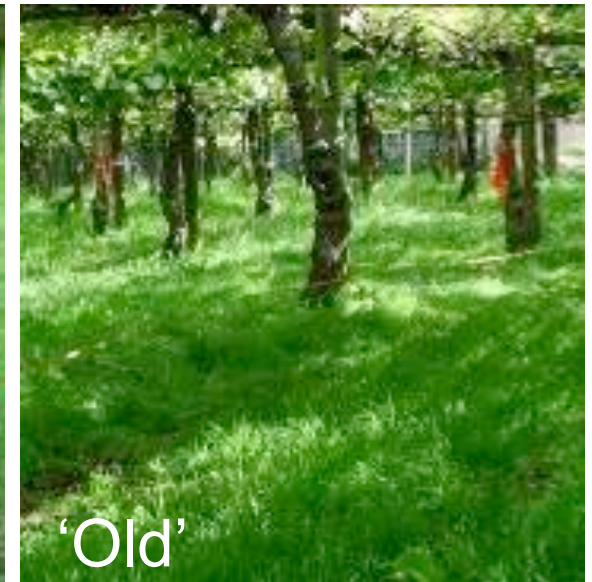
- 1) Maximum sampling depth?
- 2) Different zones (e.g. Vine row vs. Grass alleyway)?
- 3) Which depth increments?
- 4) How many cores per kiwifruit block?
- 5) Spatial dimensions of sampling bay?



# Site

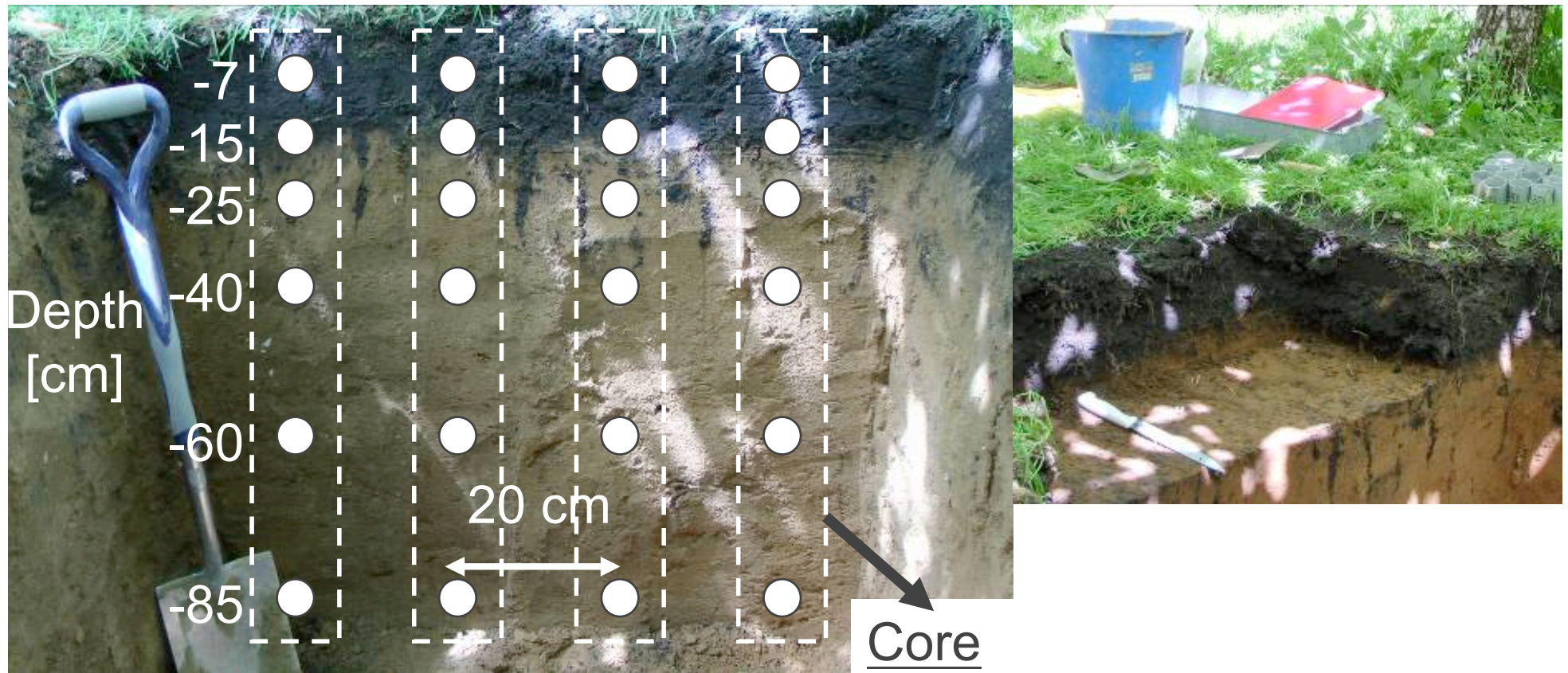
## Bay of Plenty – Te Puke

- Hort16a ('Gold')
- 'Young' – 10 years
- 'Old' – 25 years



- Te Puke sandy loam
- 1 soil pit in each block

# Sampling and analysis



- 4 cores in the vine row, 4 cores in the grass alleyway
- Bulk density, soil organic carbon content measurement
- Soil organic carbon content with loss on ignition method

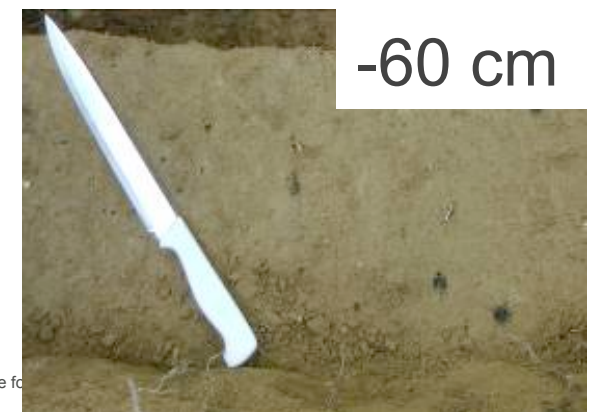
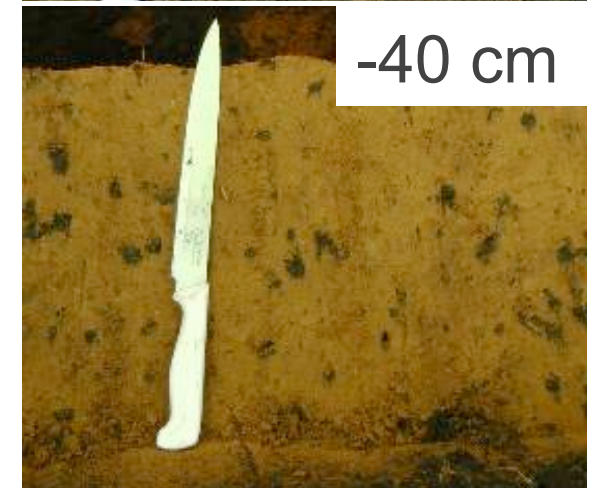
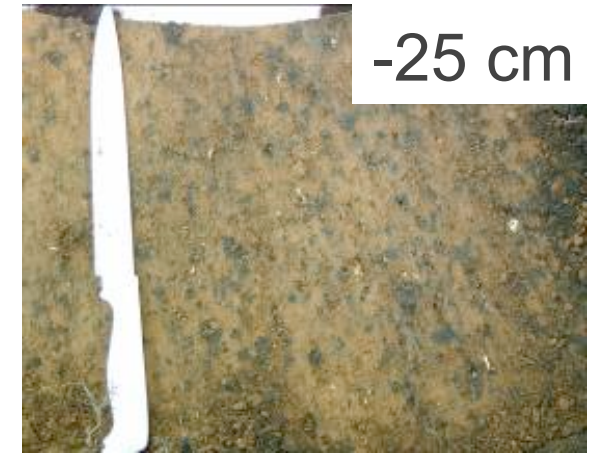
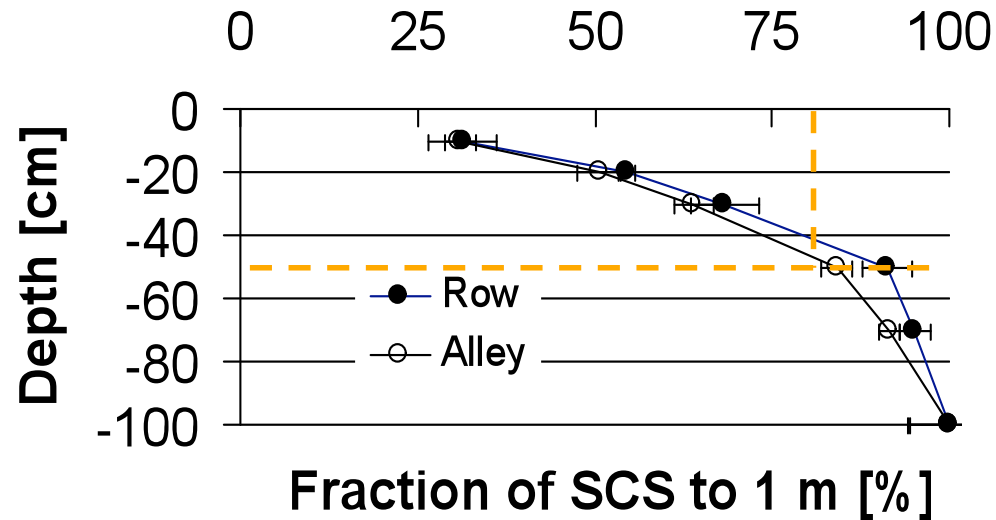




# What should be the maximum sampling depth?

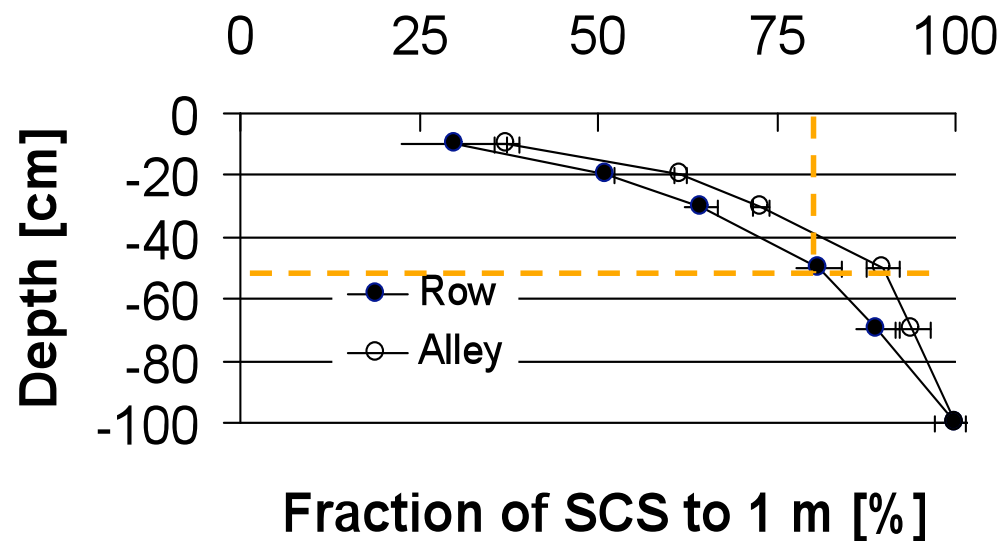
'Young'

~139 t C/ha



'Old'

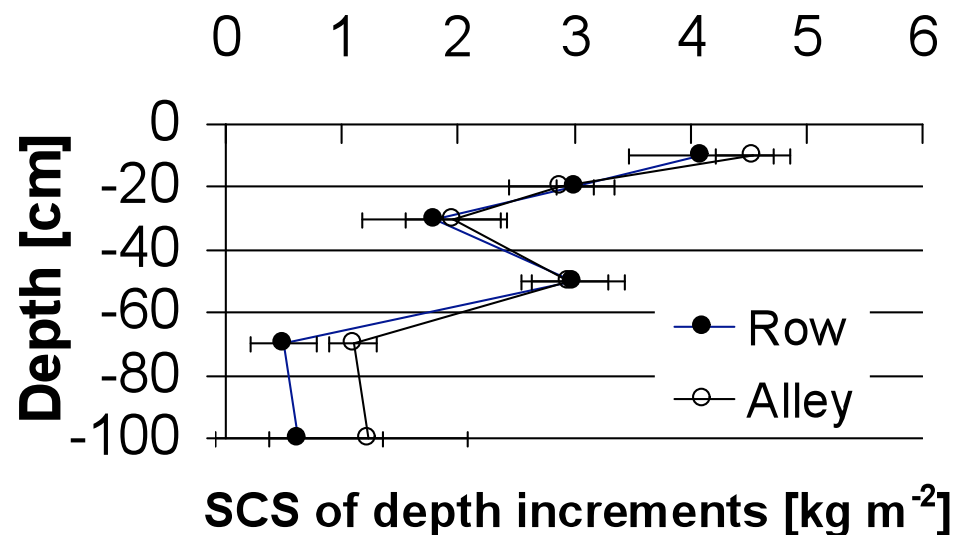
~145 t C/ha



# How many zones do we need to sample?

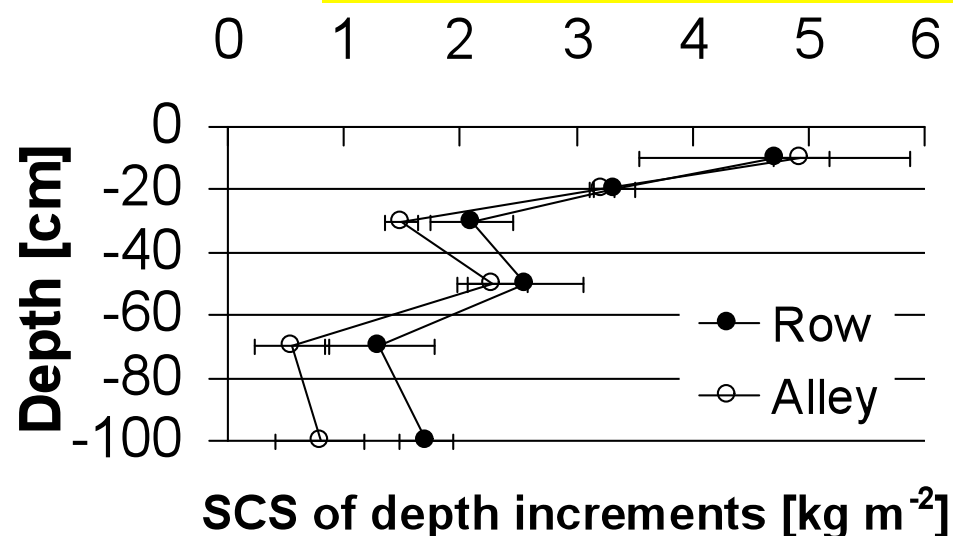
'Young'

No significant differences vine row vs. grass alley way



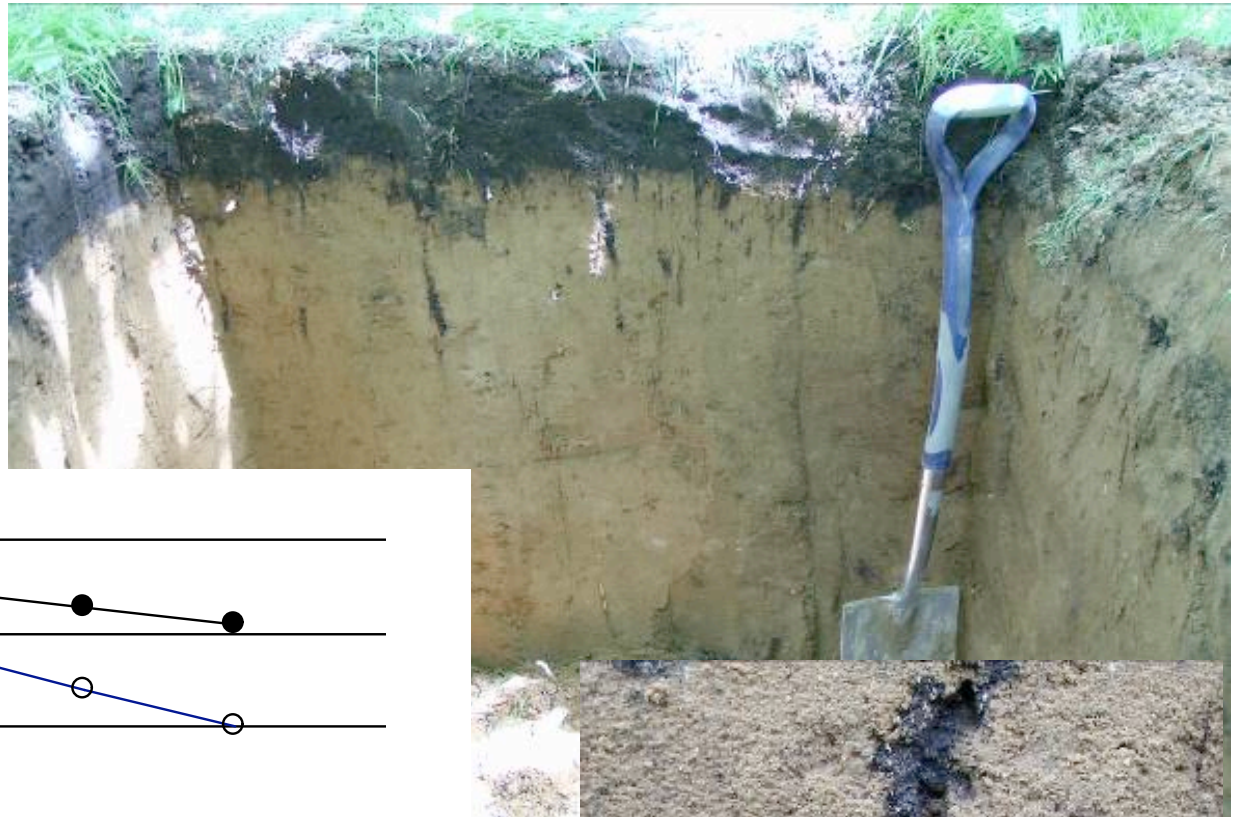
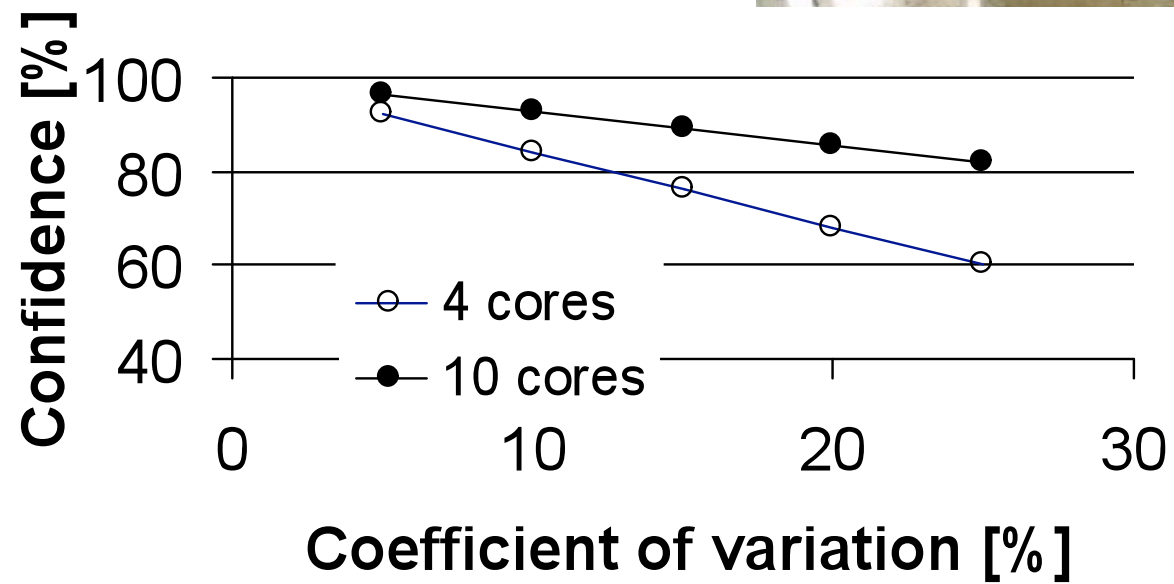
'Old'

Below 50 cm: Higher SCS in row compared to alley





# How many cores do we need per orchard block?





# Into which depth increments to we divide each core?

0-10 cm

Most sensitive to management

10-30 cm

Current international standard (Kyoto)

30-50 cm

About 80-90% of SCS to 1 m depth

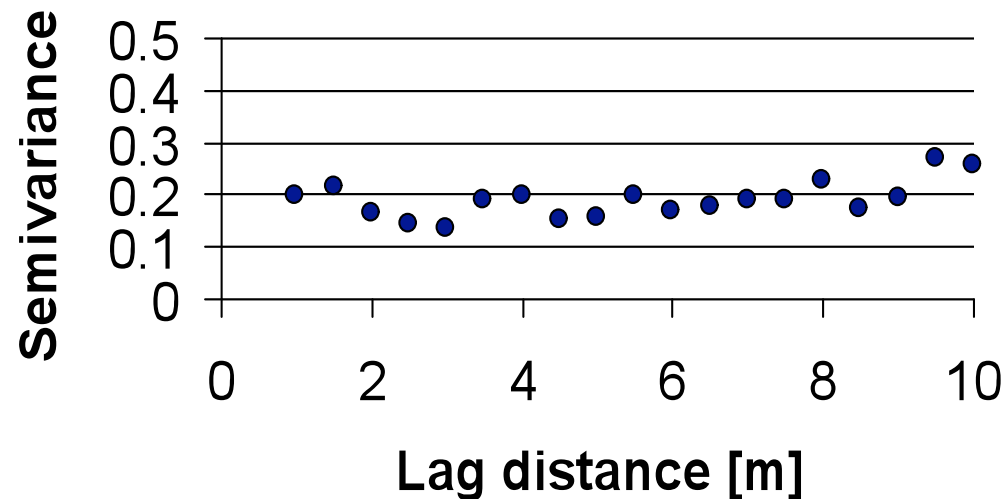
50-100 cm

If dynamics of SCS are of interest

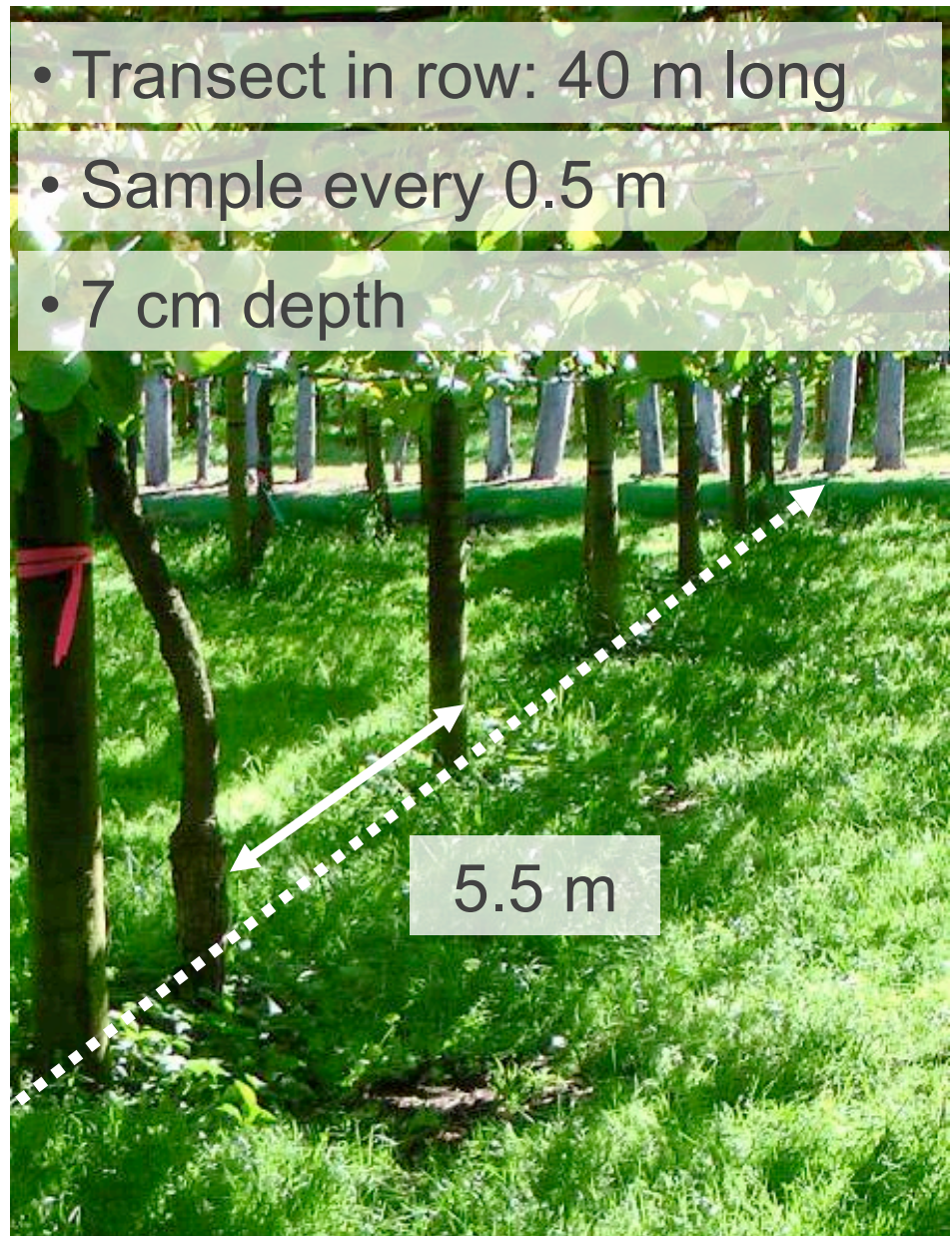
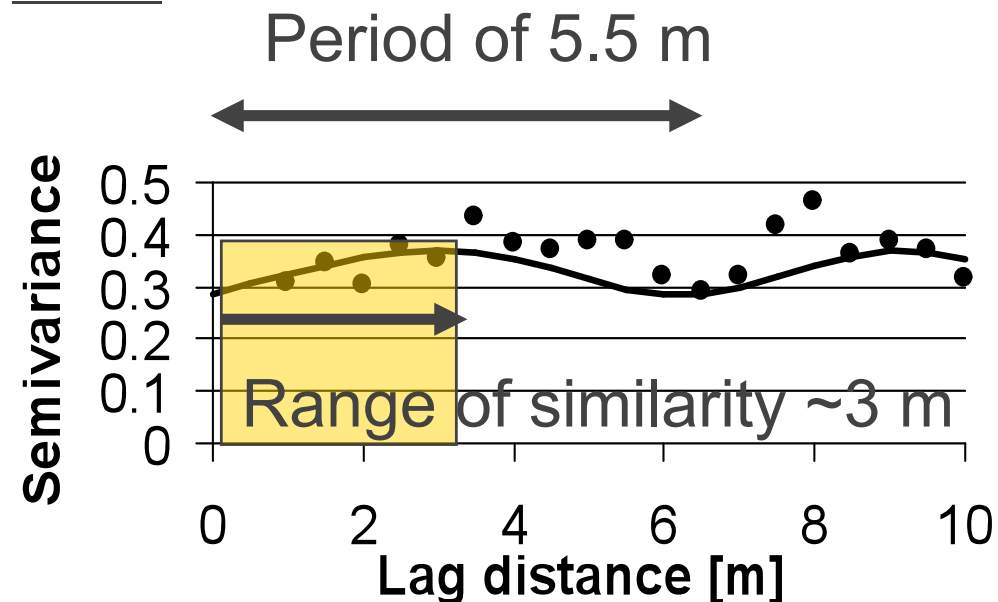


# What should be the spatial dimension of a sampling bay?

## 'Young'



## 'Old'

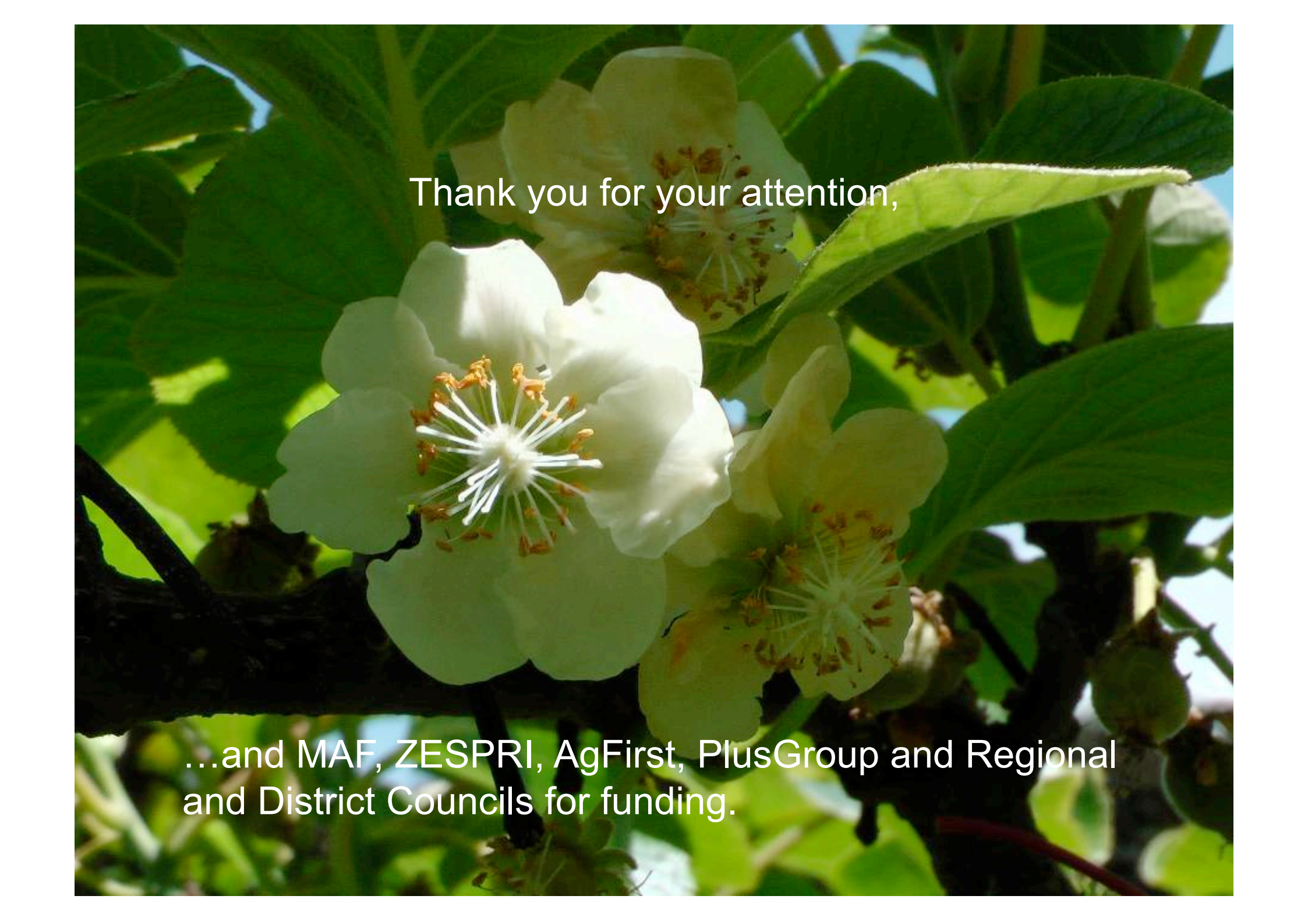




# Preliminary conclusions

- (1) 80-90% of the SCS to 1 m depth were in the top 50 cm. Significant differences between 'young' vs. 'old' and row vs. alley only if depths below 50 cm included.
- (2) Row and alley need not to be separated for an SCS inventory with sampling to 50 cm depth (**no** herbicides!)
- (3) We suggest to separate each core for a SCS inventory into 0-10, 10-30, 30-50 cm depth. For SCS dynamics the increment from 50-100 cm depth should be added.
- (4) We recommend sampling bays to be 3 m x 3 m

Next steps: Confirmation of results in other orchards; impact of herbicided strips; survey in different regions (Green, Gold, organic, integrated, 2 soil texture groups)



Thank you for your attention,

...and MAF, ZESPRI, AgFirst, PlusGroup and Regional  
and District Councils for funding.