

# Long-term rotation experiment Glen Innes

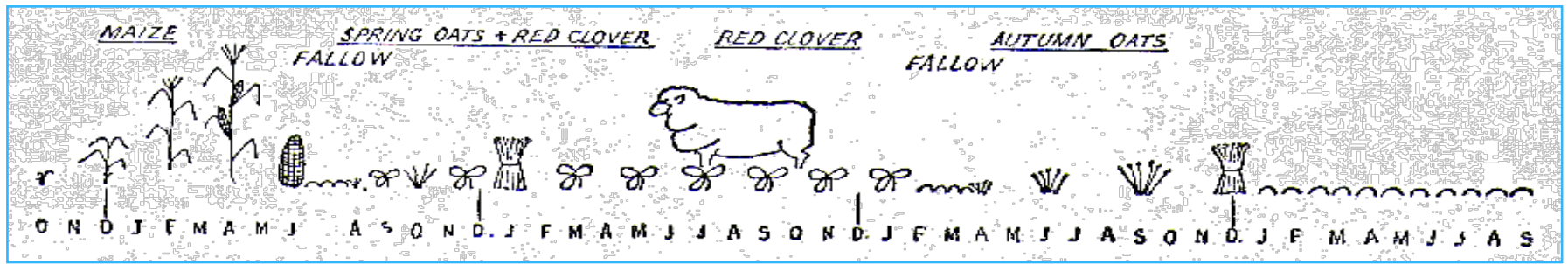
## Soil carbon lessons from 100 years

- Established in 1921
- Oldest LTR in Australian summer rainfall zone
- Established to develop sustainable systems

# LTR Experiment

---

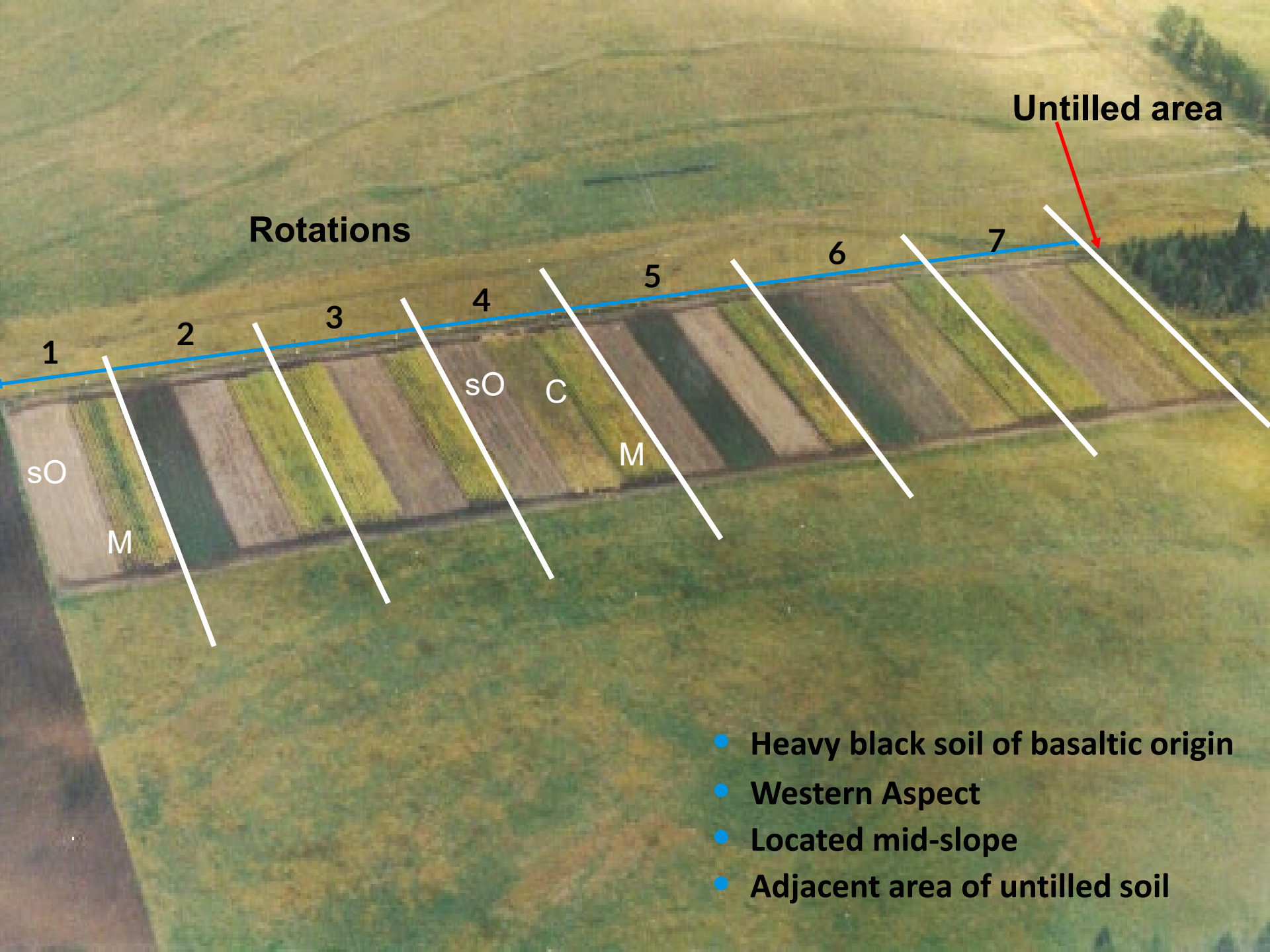
- No randomisation or replication
- Total of 23 plots (10m x 70m)
- Each crop of each rotation represented at any time
- Crop sequences compared in 12 year cycles



# LTR Experiment - Rotations

---

1. Maize - Spring Oats (MsO)
  2. Maize - Spring Oats - Autumn Oats (MsOaO)
  3. Maize - Maize - Spring Oats (MMsO)
  4. Maize - Spring Oats - Clover (MsOC)
  5. Maize - Spring Oats - Autumn Oats - Clover (MsOaOC)
  6. Maize - Spring Oats - Clover - Autumn Oats (MsOCaO)
  7. Maize - Maize - Spring Oats - Clover (MMsOC)
- 



**Rotations**

**Untilled area**

**1**

**2**

**3**

**4**

**5**

**6**

**7**

sO

M

sO

C

M

- Heavy black soil of basaltic origin
- Western Aspect
- Located mid-slope
- Adjacent area of untilled soil



# Value of long-term experiments

A close-up photograph of a soil profile. The soil is dark brown and appears to be a loam. A plant root system is visible, with a thick, woody taproot extending downwards. A human finger is placed vertically in the soil to provide a sense of scale. The background is a bright, out-of-focus green, suggesting a field or garden setting.

**Agricultural practices**  
= productivity gains, but can also  
= long-term soil implications

Long-term experiments allow repeated  
measurements over several years -  
decades necessary to detect changes

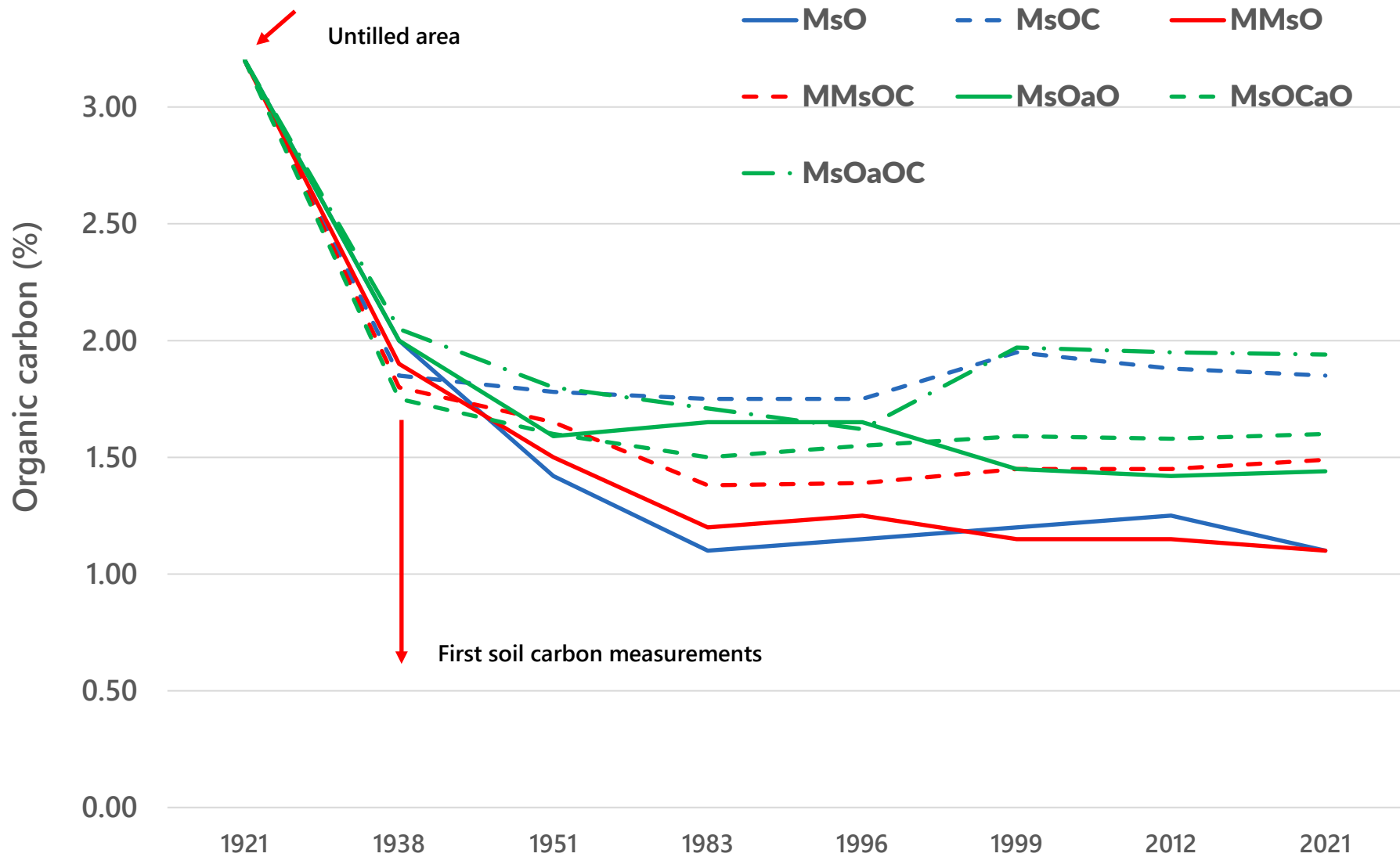


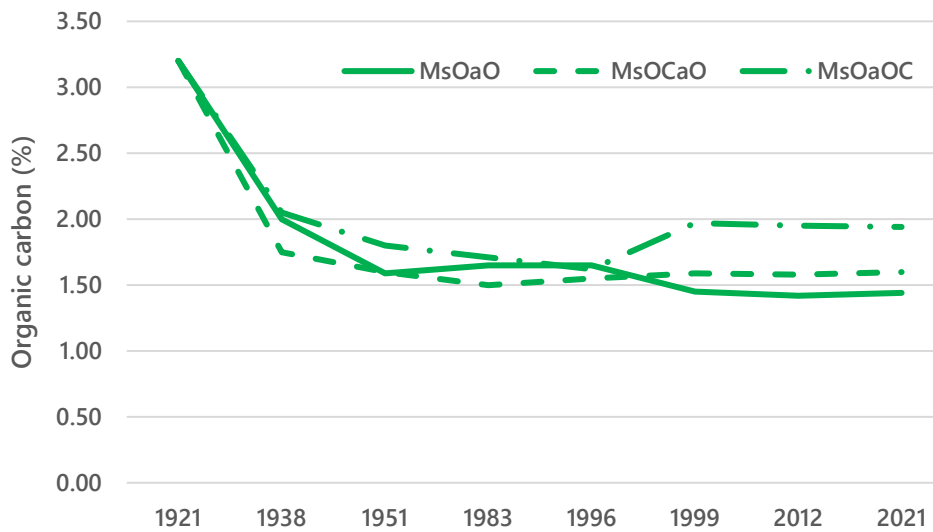
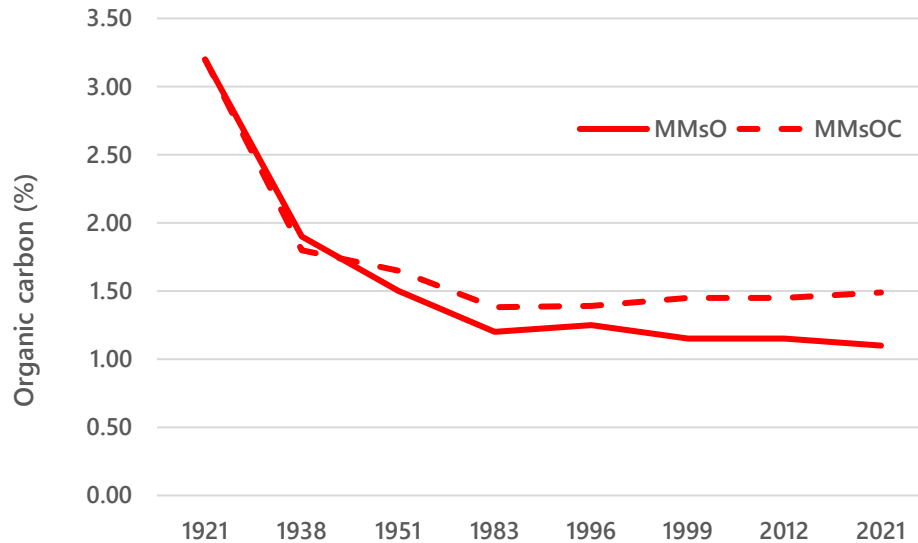
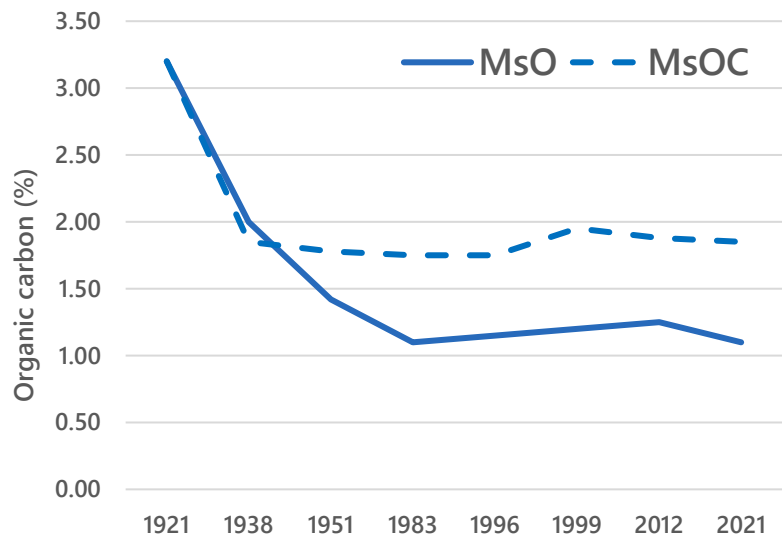
# Soil carbon

---

- Enhances all aspects of soil fertility
- Good indicator of soil health
- Good indicator of agronomic stability
- Sequestration of C in soil – climate change solution?
- Increasing soil C – environment, soil, time, mgt

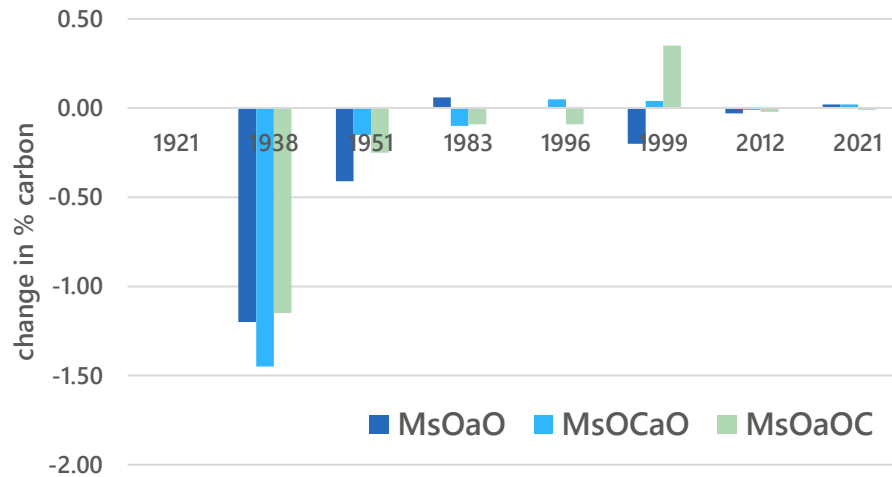
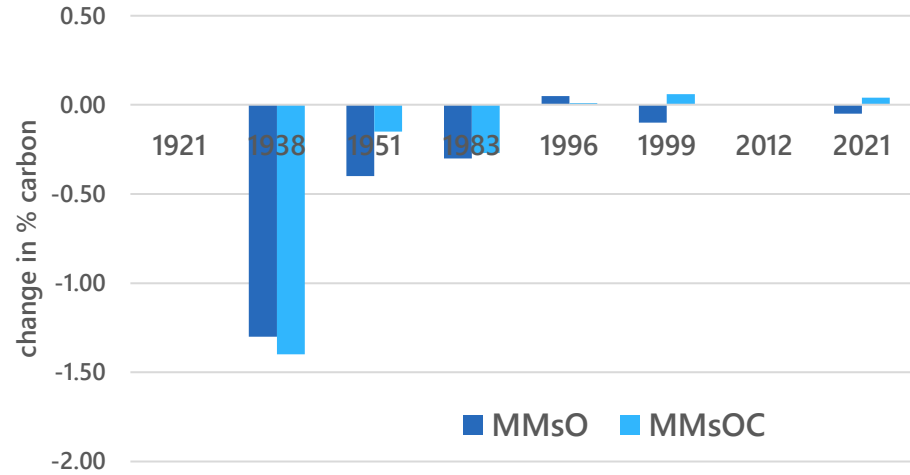
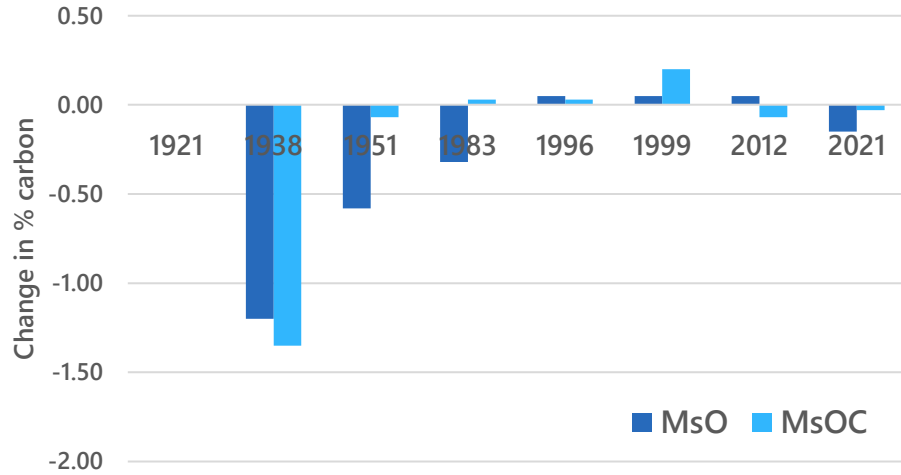
# LTR Experiment - Organic Carbon (1921-2021)



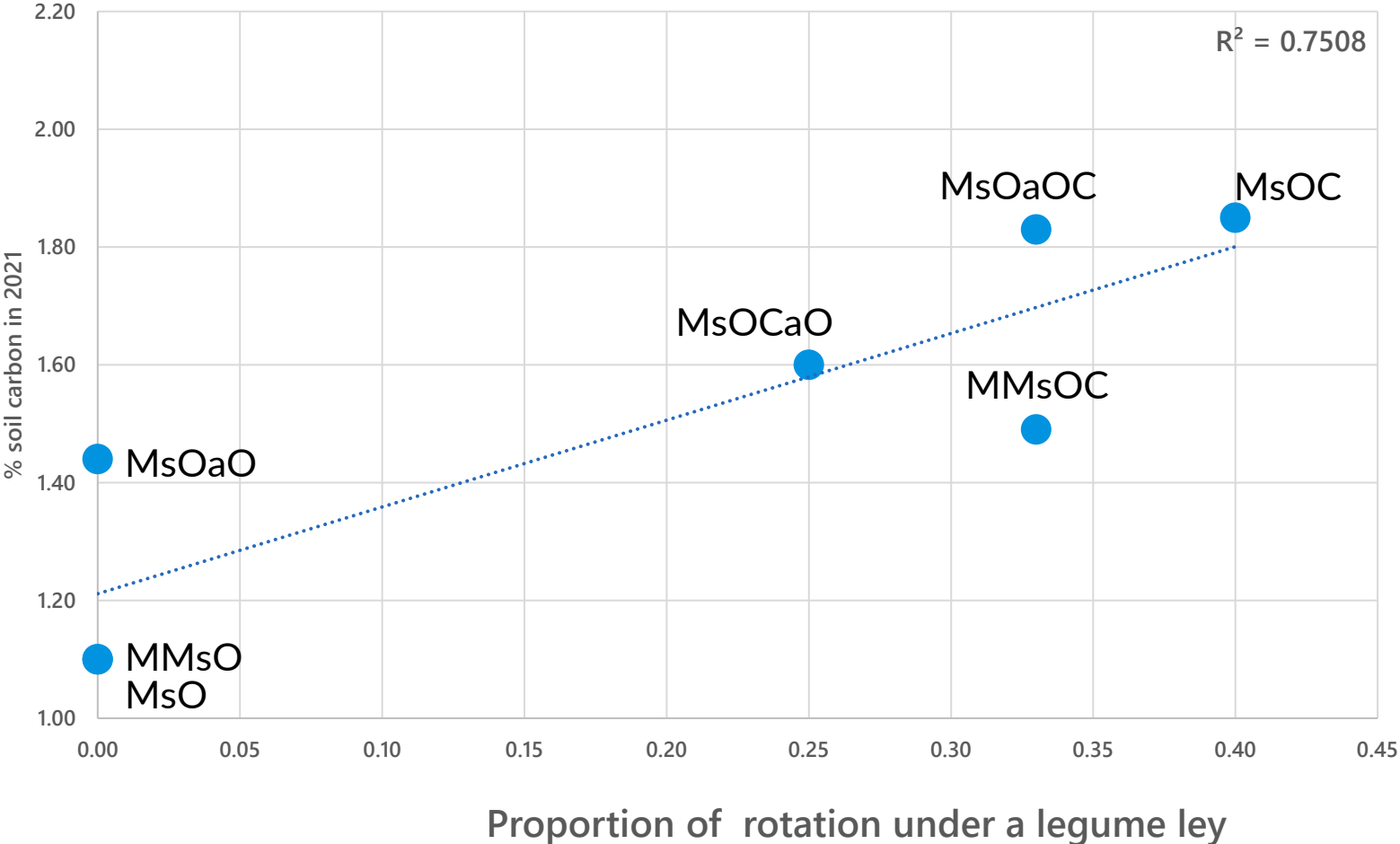




# Soil Carbon - rate of change



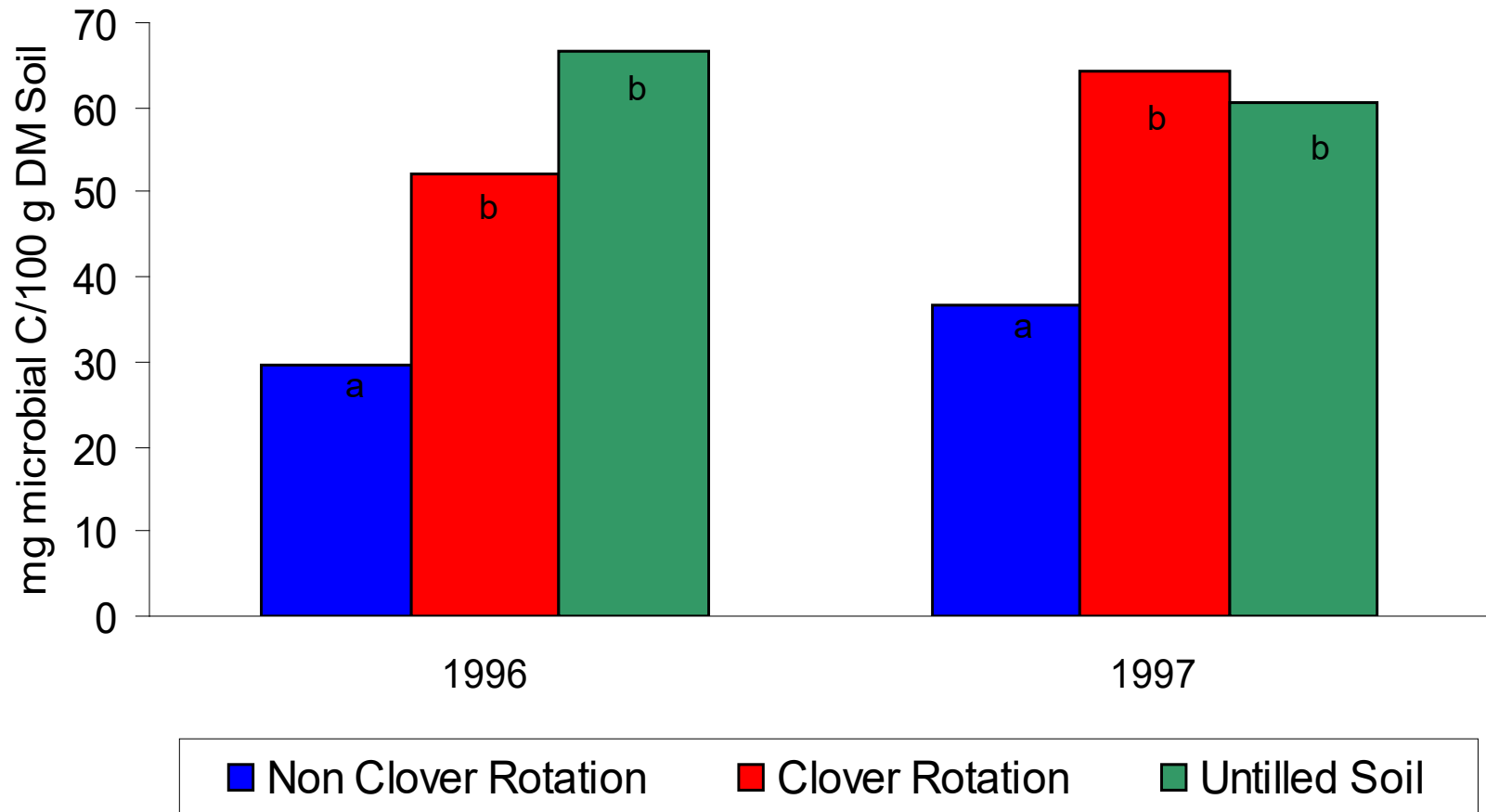
# Increased soil carbon correlated with proportion of rotation under legume ley



# LTR Experiment - Soil Biology

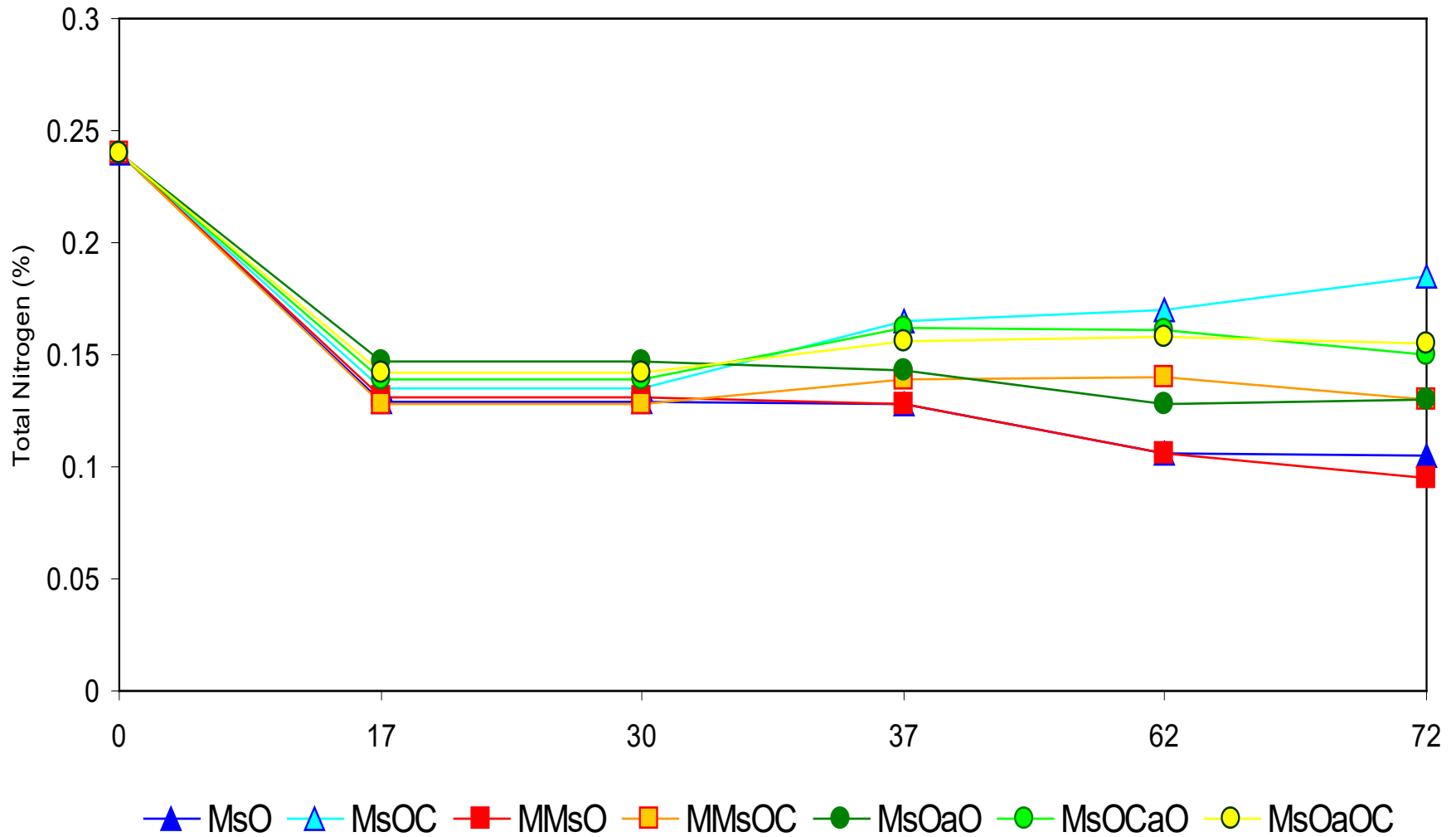
---

Microbial Biomass at 0-5 cm





# LTR Experiment - Soil N



# LTR Experiment – soil properties

---

- Soil surface = sub soil material + high clay content
- Surface lowering of 15-30 cm across all plots
- Equals an erosion rate of 20-40 t/ha per year
- Higher rate of erosion that is tolerable for soil type
- Are any of the rotations are sustainable?

# What have we learnt

---



- Long-term experiments useful for monitor decadal change
- Changes in soil carbon are variable
- Rotations with legume leys = higher levels of OC & N, productivity
- More time under legume ley = higher OC & N
- Legume ley had positive effect on biological activity
- However, severe erosion across all plots questions their stability



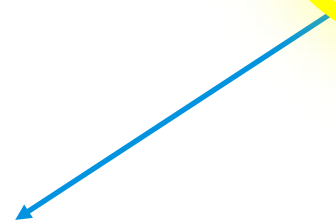
# LTR Expt - Future Directions

---

A unique resource to monitor productivity & sustainability over 100 years.

**Community Resource**

*We welcome feedback*



Is 100 years of data enough – do we need more? What are the gaps? What are the opportunities.



Objective is to fine-tune the treatments to develop farming systems that will assist to restore degraded cropping areas in NW NSW