Pulse Crop Impact on Soil Quality Attributes in Wheat-based Crop Rotations

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Introduction

- Conventional agricultural systems on the Canadian Prairies have severe consequences
- Crop producers interested in diversification of crop rotations
- Inclusion of pulse crops in crop rotations

- Inclusion of pulses in wheat-based cropping systems has many advantages;
    - Lesser dependence on synthetic nitrogen fertilizers
    - Reduced greenhouse gas emissions
    - Reduced carbon foot prints
    - Enhanced soil fertility
    - Improved water and nutrient use efficiency due to the root depth variations of pulses and wheat

but also has disadvantages..

- Establishment costs
- Poor ground cover
- Increased vulnerability to soil erosion
- May need specific knowledge for growth and management
- May serve as common host for some pests and diseases

Objectives

1) To examine the impact of different **pulse crop species** on selected soil physical, chemical and biological properties under rain-fed conditions in semi-arid Canadian Prairies.

2) To compare the impact of **pulse crop rooting depth** (shallow and deep-rooting) on selected soil physical, chemical and biological properties under rain-fed conditions in semi-arid Canadian Prairies.

Different crops allocated in different treatments

Treatments	Description
W-**W**-W-W	Continuous wheat -Control
W-**P**-W-P	Shallow rooted pulse crops (pea)
W-**L**-W-L	(lentils)
W-**C**-W-C	Deep rooted pulse (chickpea)
W-**L**-W-C	Alternating with shallow root + deep root pulses (lentil and chick pea)

Key:- W- Wheat, P- Field pea, C- Chickpea, L- Lentil

- Randomized Complete Block Design
- 4 replicates for each treatments

Soil Quality Parameters

Physical

- Soil aggregate size distribution (0-5 cm)
- Bulk density (0-15 cm)
- Available water content (0- 120 cm)

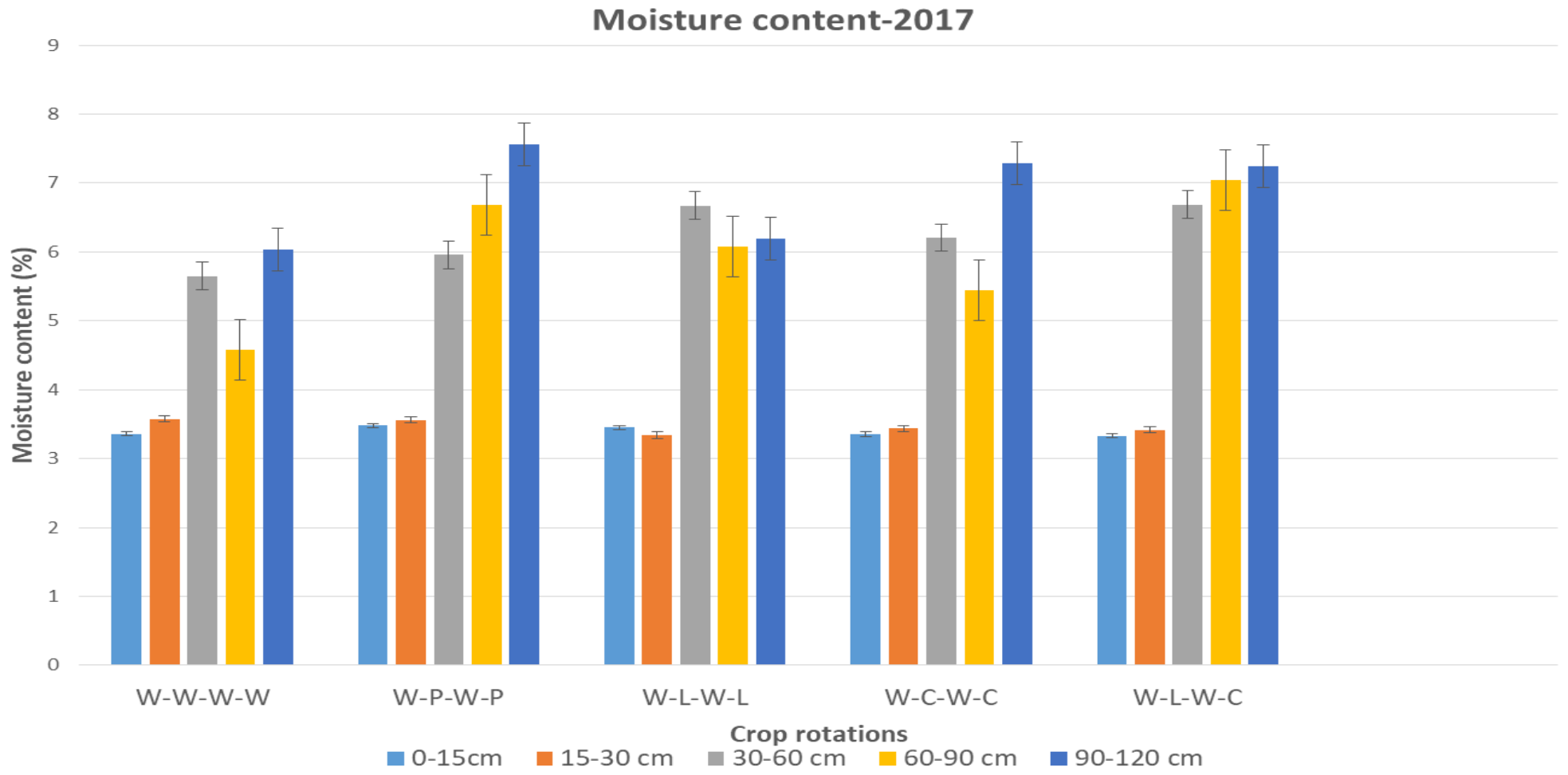
Biological

- PLFA (0-60 cm)
- Organic matter content (0-60 cm)

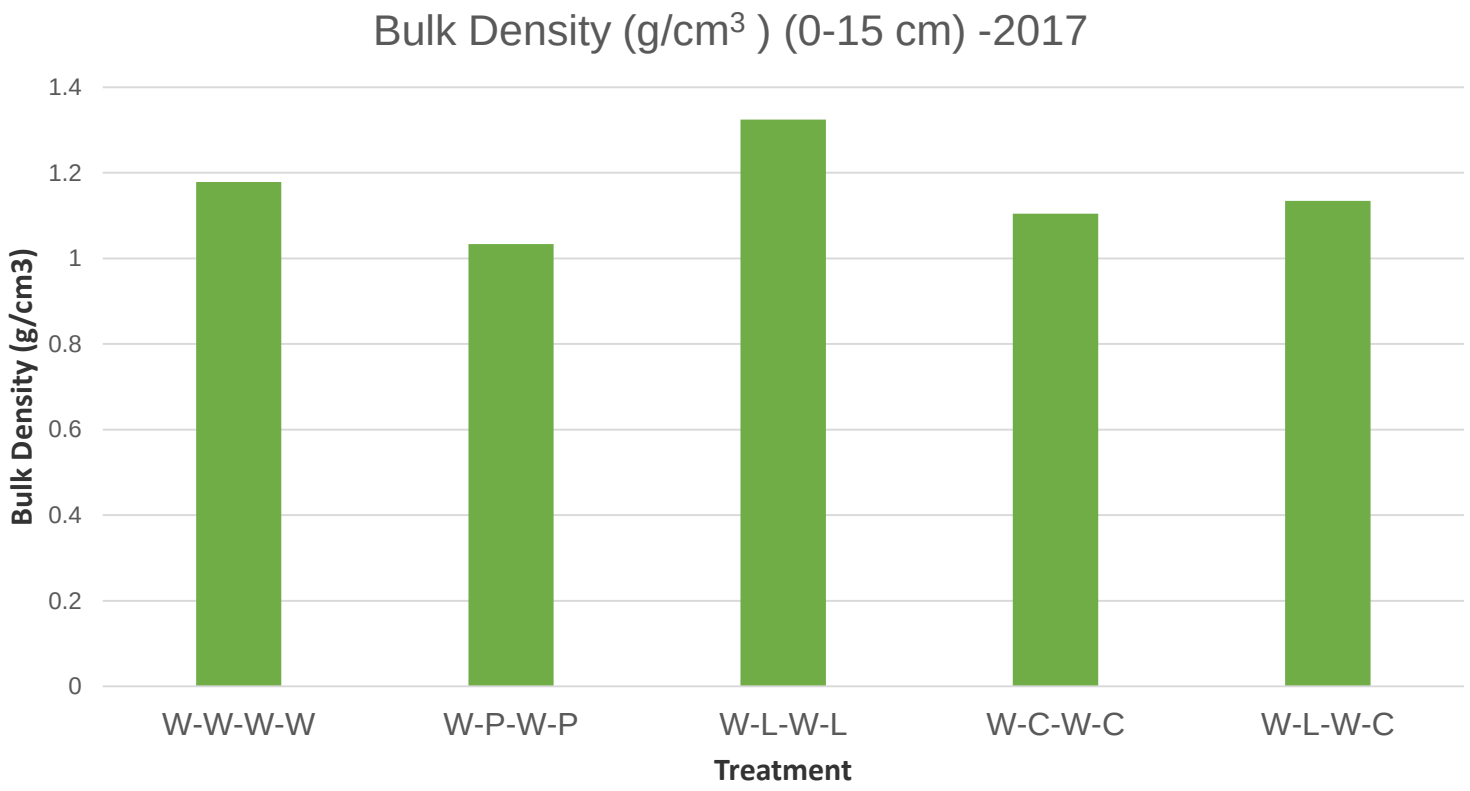
Chemical

- Soil pH (0-15 cm)
- Electrical conductivity (0-15 cm)
- Potentially mineralizable N (0-15 cm)
- Total soil carbon and nitrogen ratio (0-60 cm)

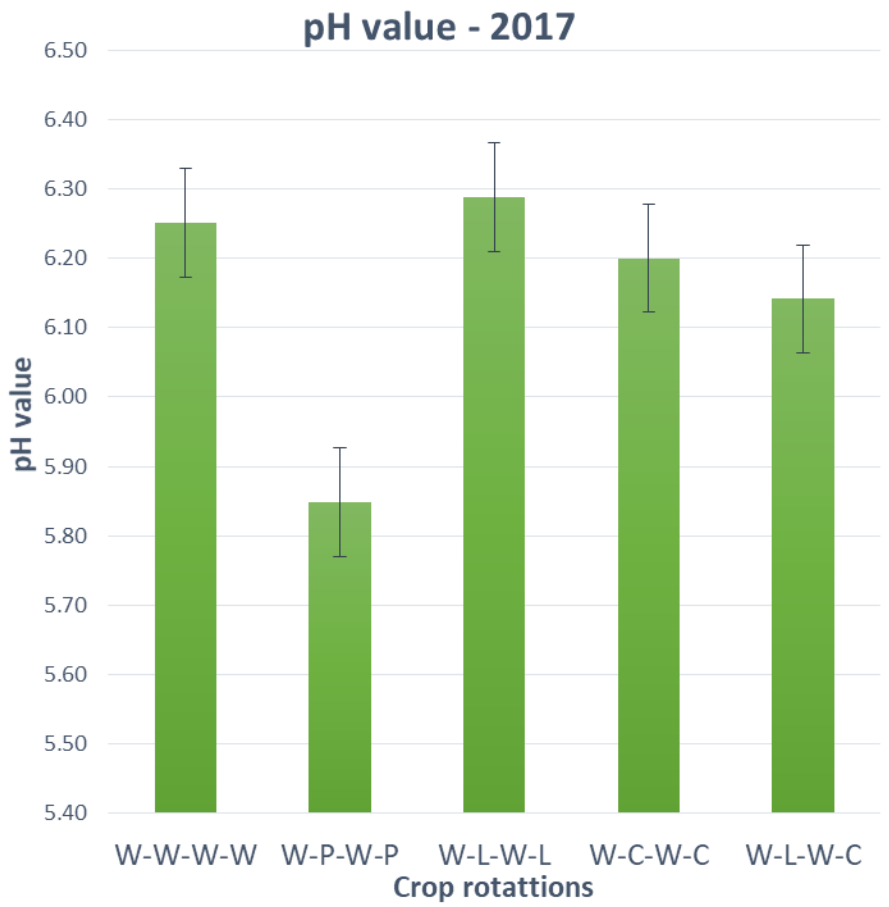
Soil Analysis- Physical

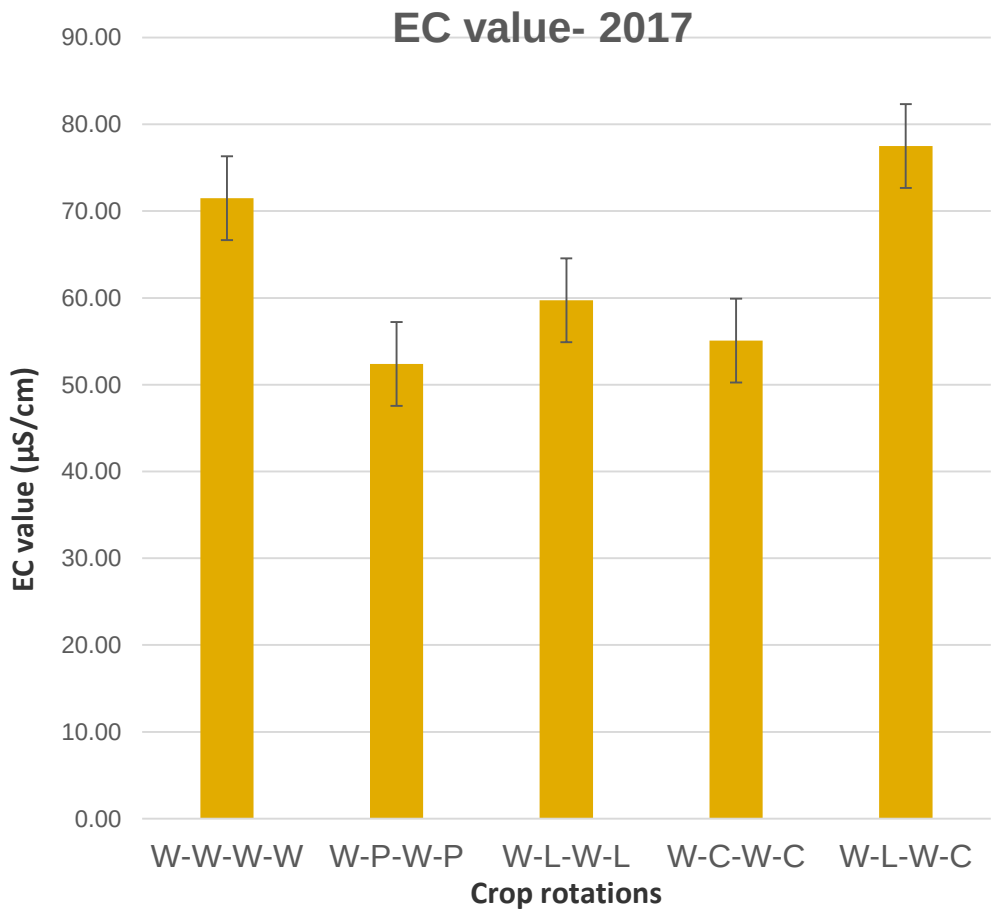


Soil Analysis- Physical

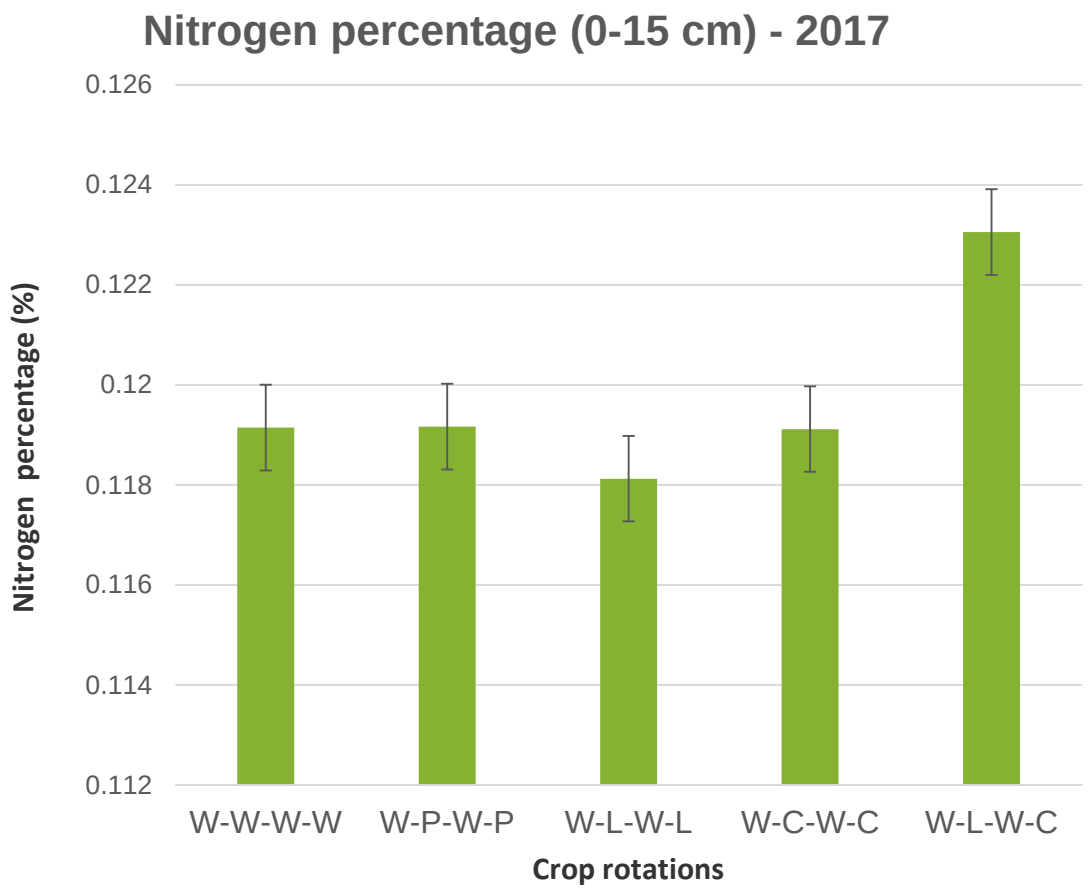


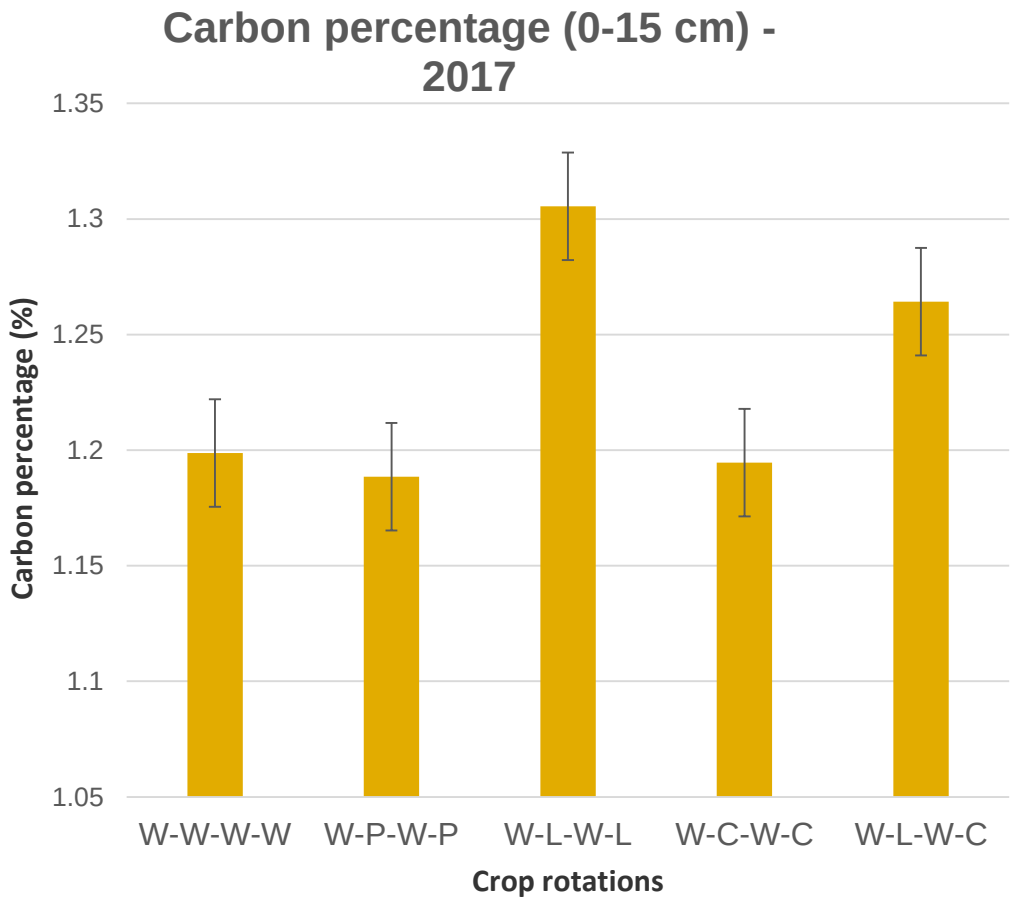
Soil Analysis- Chemical

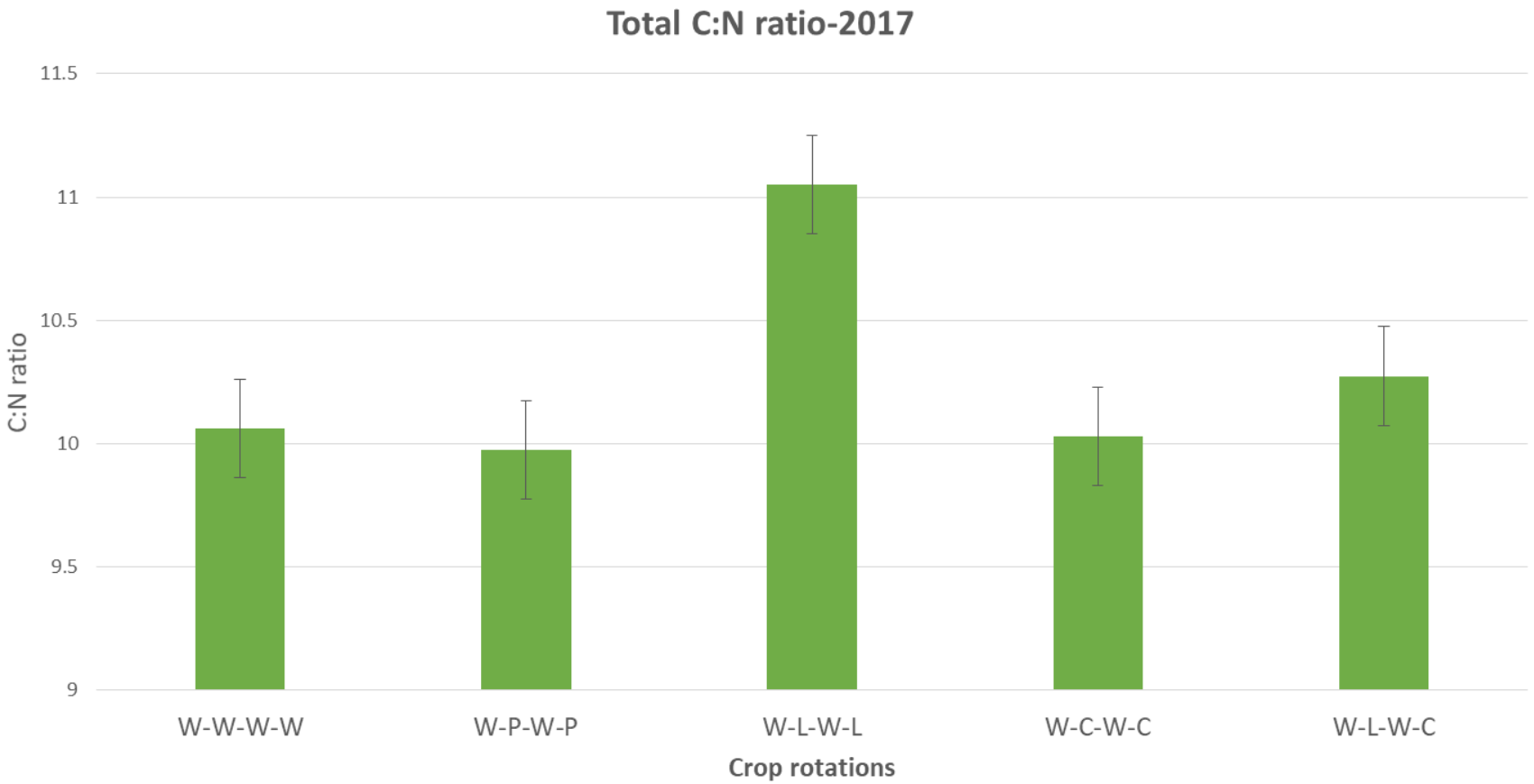




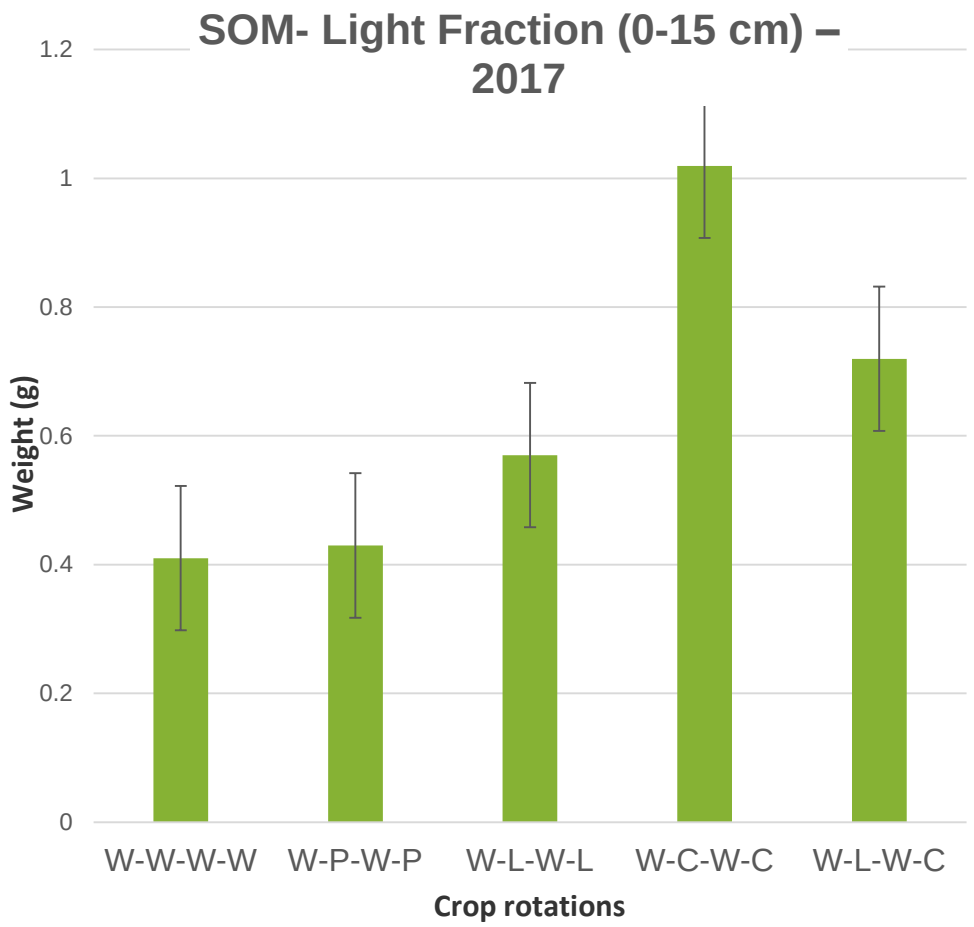
Soil Analysis- Chemical

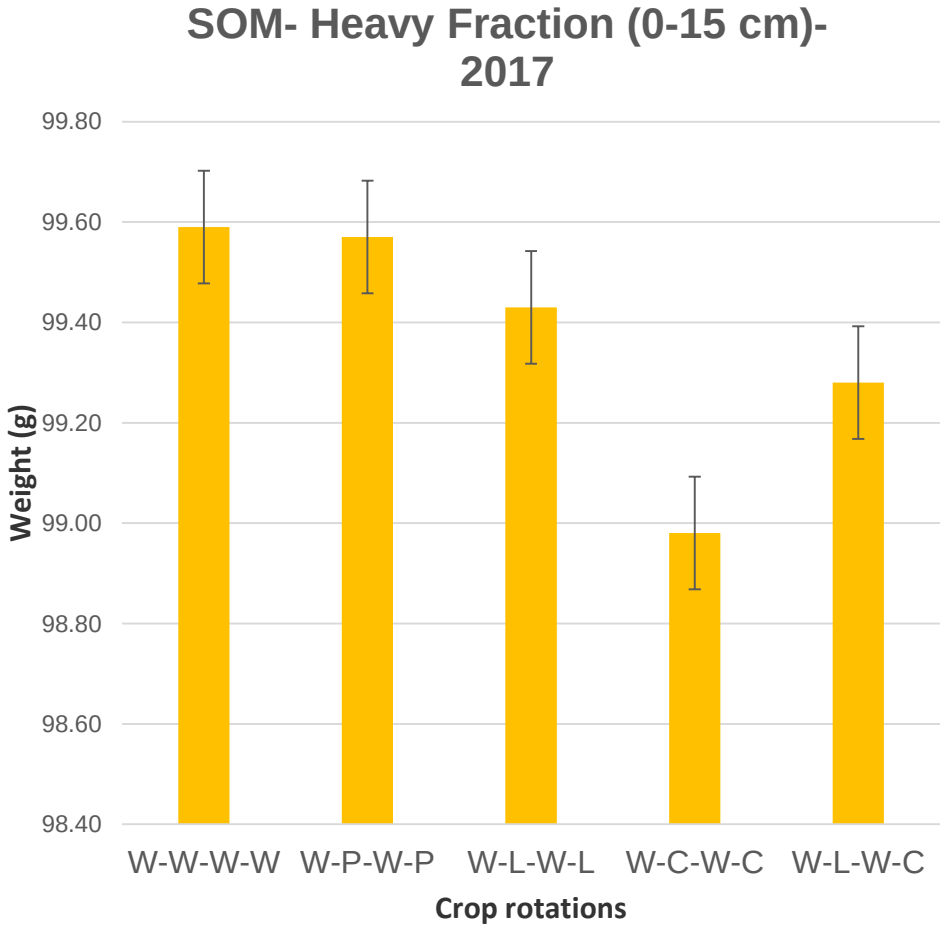





Total C:N ratio-2017
11.5
11
10.5
10
9.5
9
C:N ratio
W-W-W-W
W-P-W-P
W-L-W-L
W-C-W-C
W-L-W-C
Crop rotations

Soil Analysis- Biological





Activities in progress…

- Few parameters in soil samples collected in 2017
    - Nitrogen mineralization
    - PLFA
    - Carbon and nitrogen content in organic fractions

- 2018 sampling and soil analysis

Acknowledgement

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