



Cover Crop Mixtures Inter-seeded in Corn on Contrasting Topographical Positions: Comparing Soil Effects in the US and Ukraine



Valeriy M. Svitovuy¹, Alexandra Kravchenko², Andrey Guber² and Karen Renner²

¹ Department of Biology, Uman National University of Horticulture, Uman, Ukraine

² Department of Plant, Soil, and Microbial Sciences, Michigan State University, East Lansing, MI, USA

Introduction

- Corn and wheat are among most important world crops and their significance is particularly high in the U.S. and Ukraine.
- The global problem with conventional corn and wheat production is that they are heavily dependent on the use of chemical inputs, an approach that lacks sustainability and threatens environment.
- The use of cover crops, and in particular, cover crop mixtures, can provide a sustainable solution for this problem.
- However, the benefits from cover crop mixtures can vary depending on soil characteristics, terrain, and climate as much or maybe even more than those of single species covers.

Objective:

Assess above- and below-ground biomass inputs from two cover crop mixtures:

- winter-hardy (WH)** and
- winter-intolerant (WK)**

at three contrasting topographical positions:

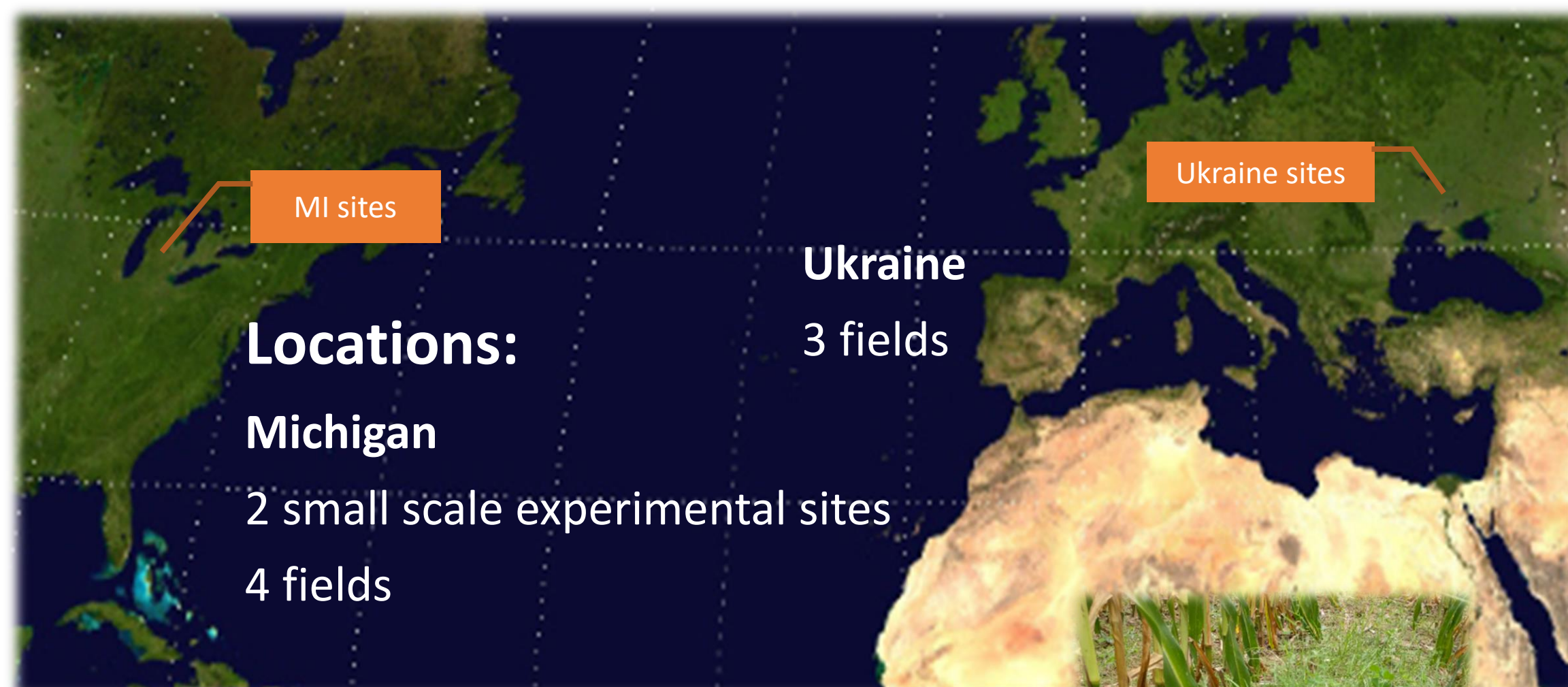
- depressions (foot and toe slopes),**
- steep slope (back slopes and shoulders), and**
- summits**

In two edaphically and environmentally contrasting geographical locations:

- Southwest Michigan, USA and**
- Central Ukraine.**

Methods

Field studies



Studied periods:

Michigan
2016 and 2017

Ukraine
2017 and 2018

Main crops:

Corn – the cover crop mixtures were inter-seeded into corn at the V5-V6 growth stage

Winter wheat – the cover crop mixtures were seeded after wheat harvest in early August

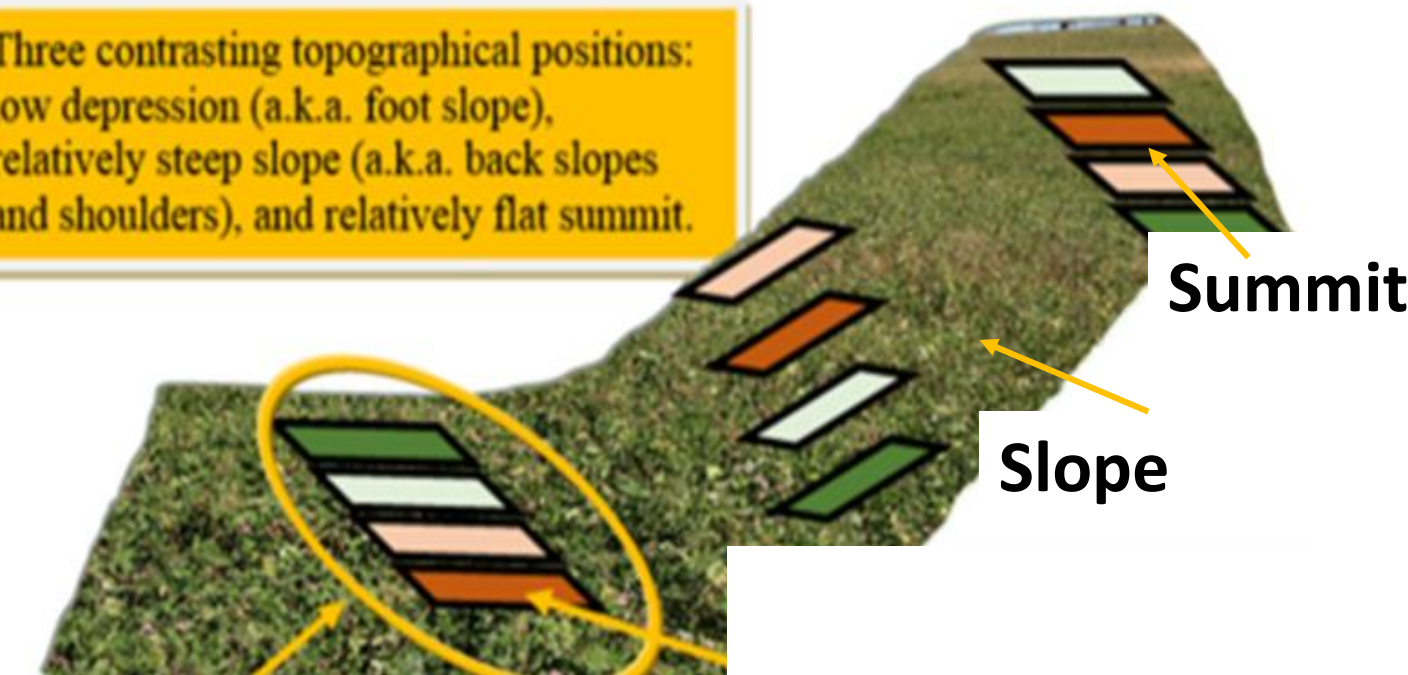
Data collection:

Cover crop above-ground biomass
Below-ground biomass
Particulate organic matter
Corn yields

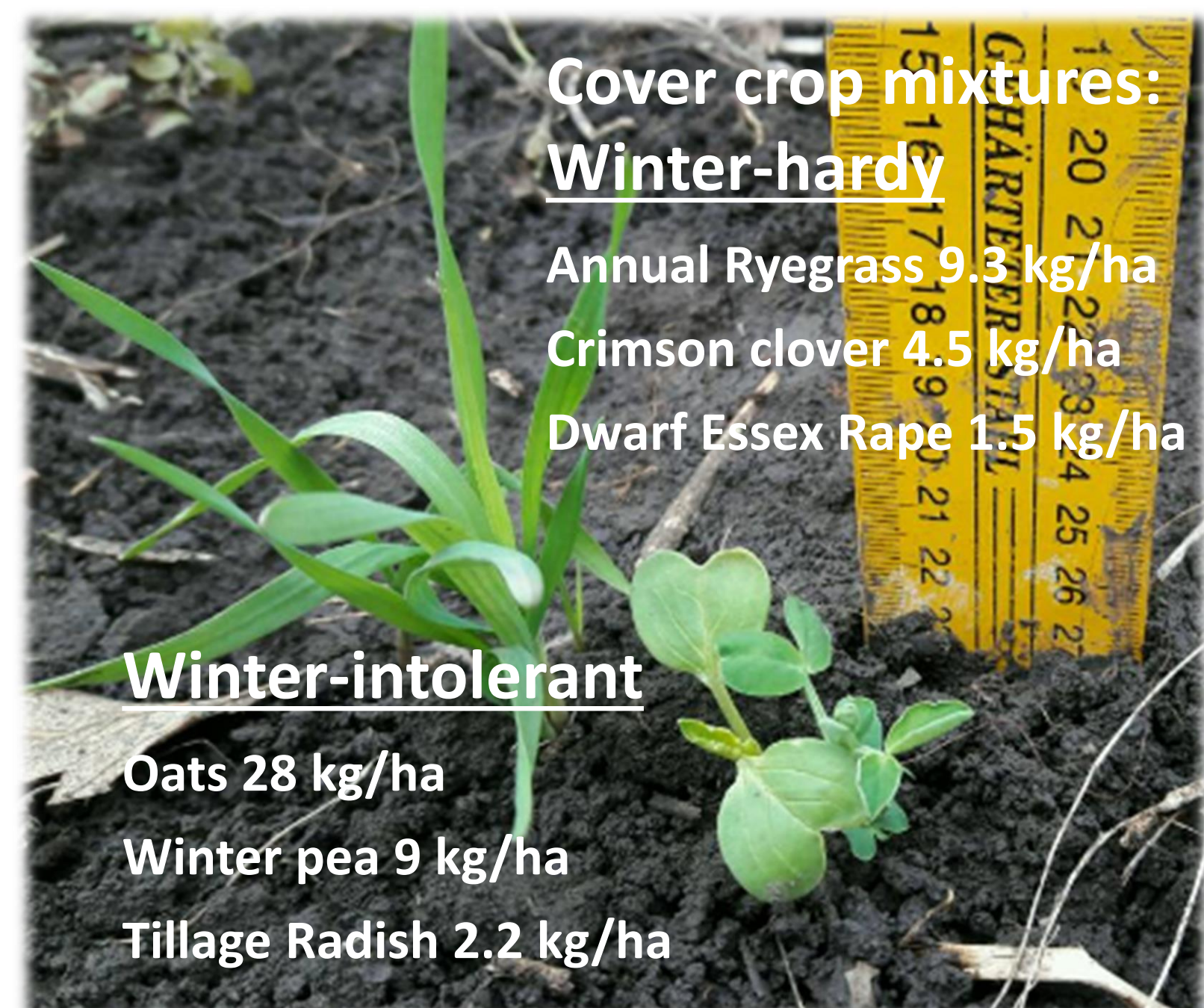


Experimental design

Three contrasting topographical positions: low depression (a.k.a. foot slope), relatively steep slope (a.k.a. back slopes and shoulders), and relatively flat summit.

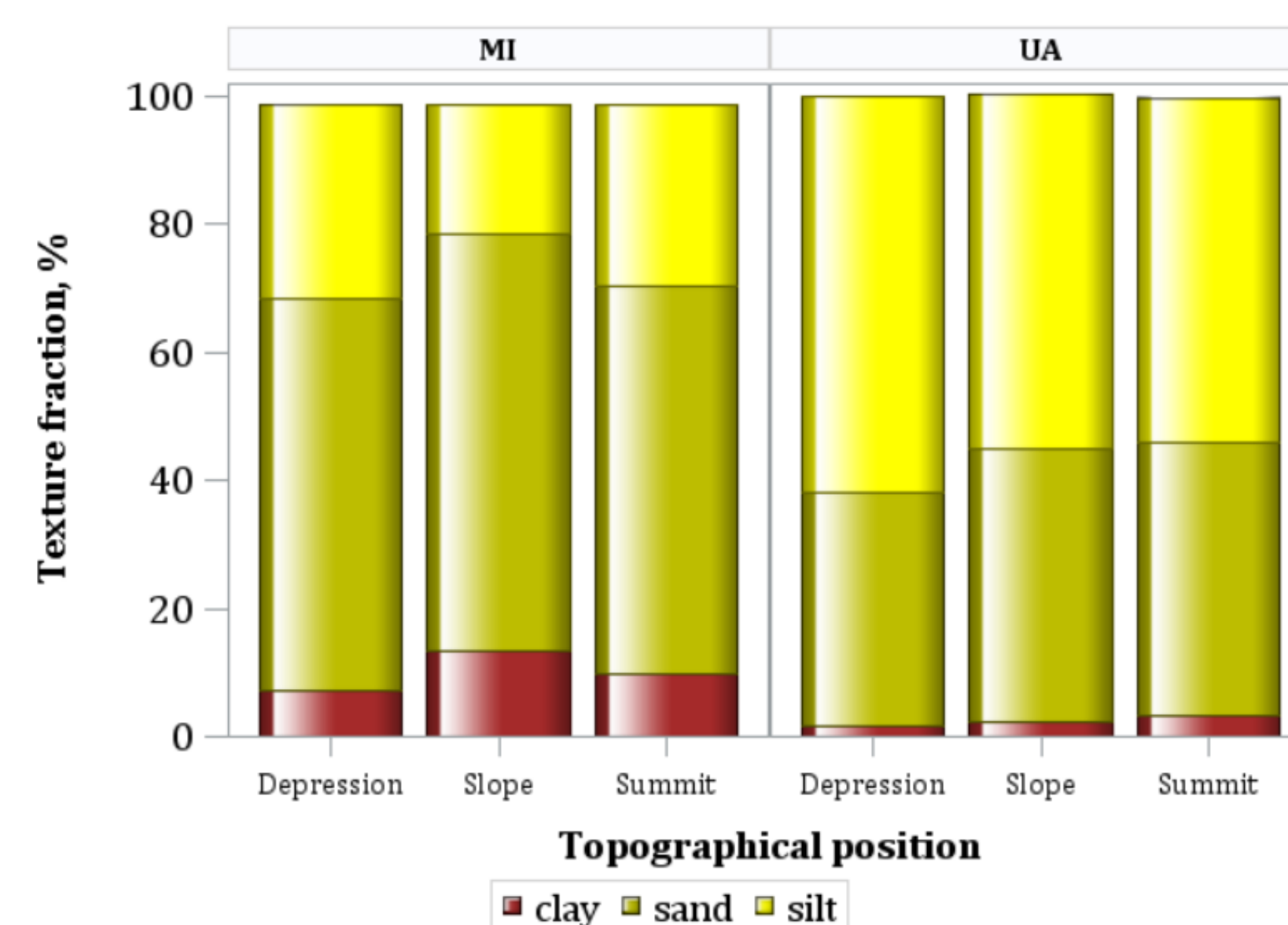


Topography: Depression

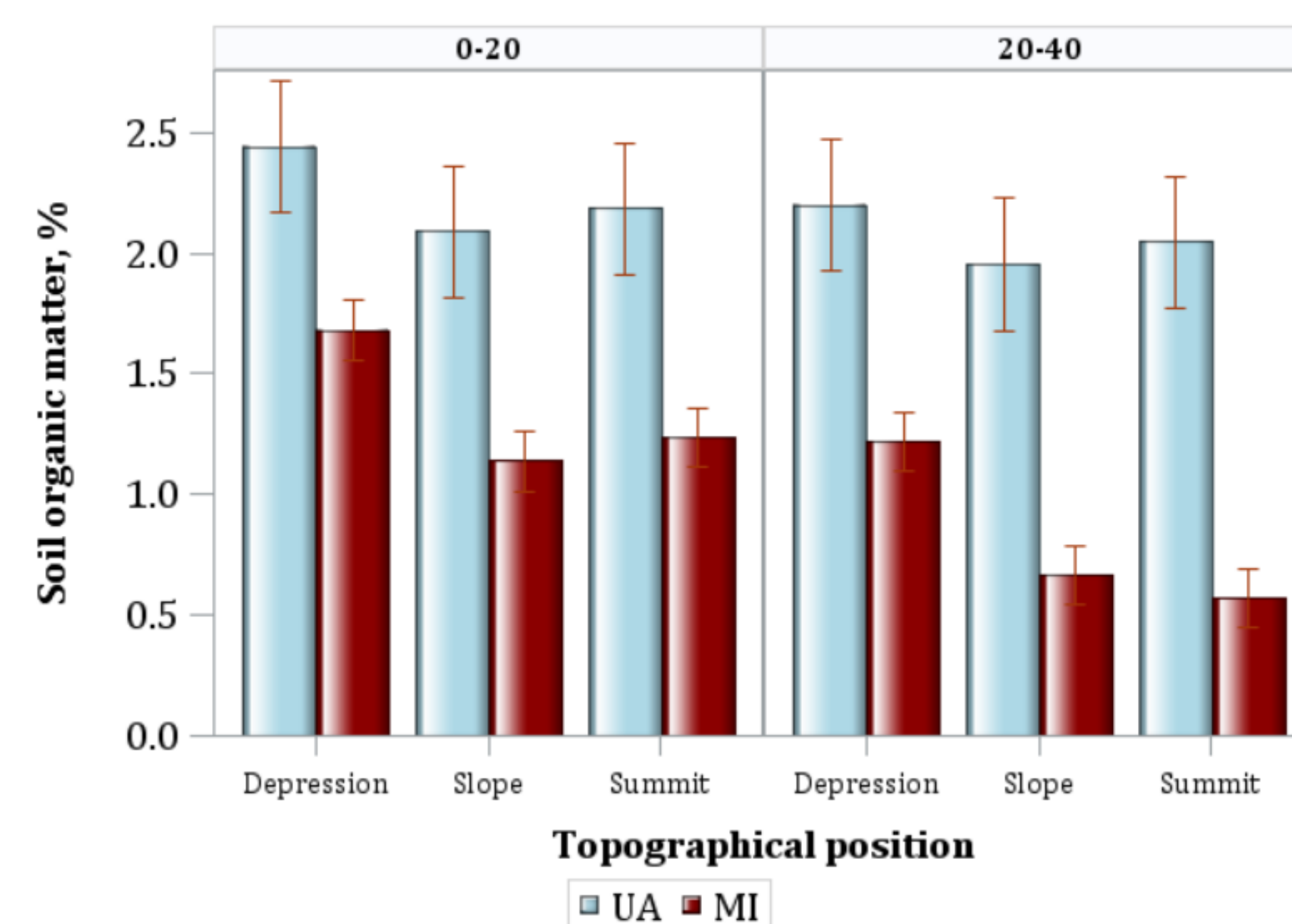


Baseline soil characteristics

Texture (0-20 cm)



Soil organic matter

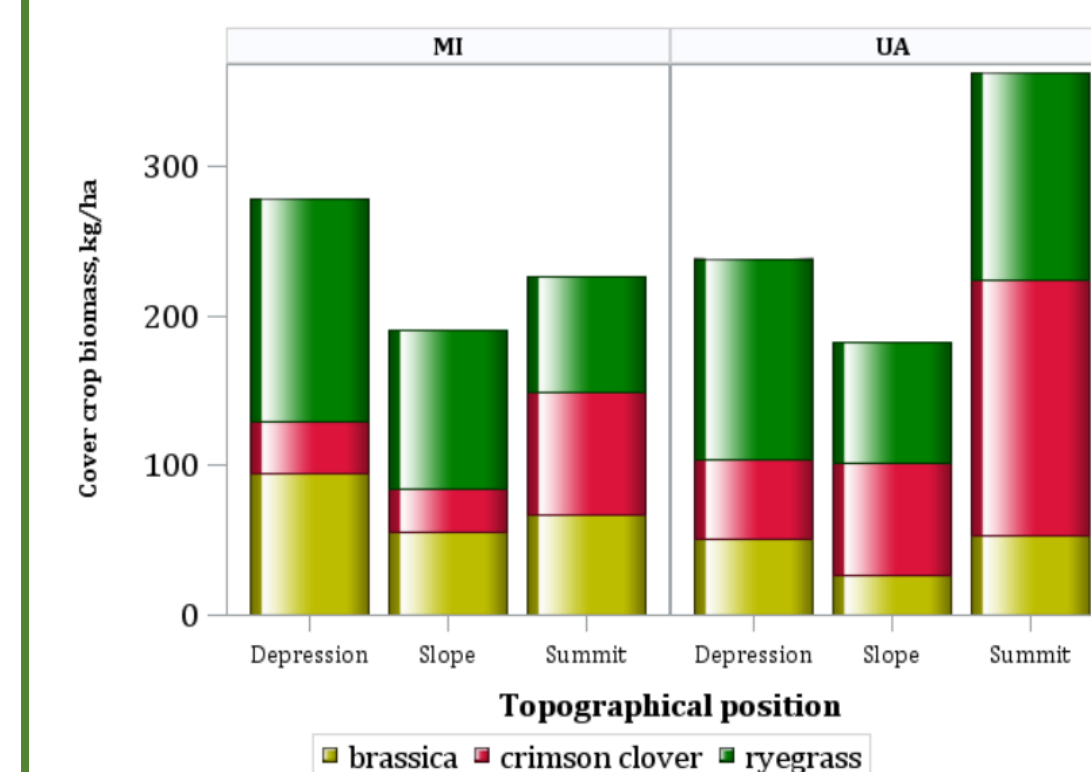


Acknowledgements

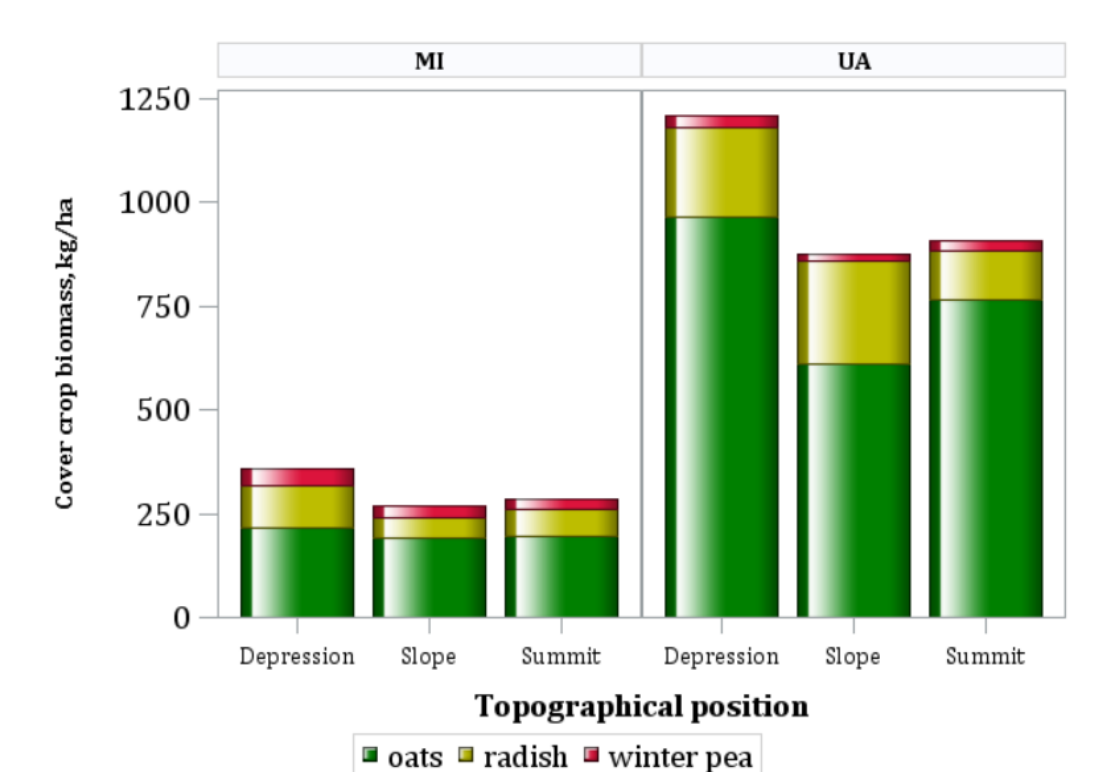
This work was funded in part by U.S. Civilian Research & Development Foundation (CRDF Global) award # OISE-16-62749-0, by USDA AgbioResearch, and by Michigan State University's Project GREEN.

Results

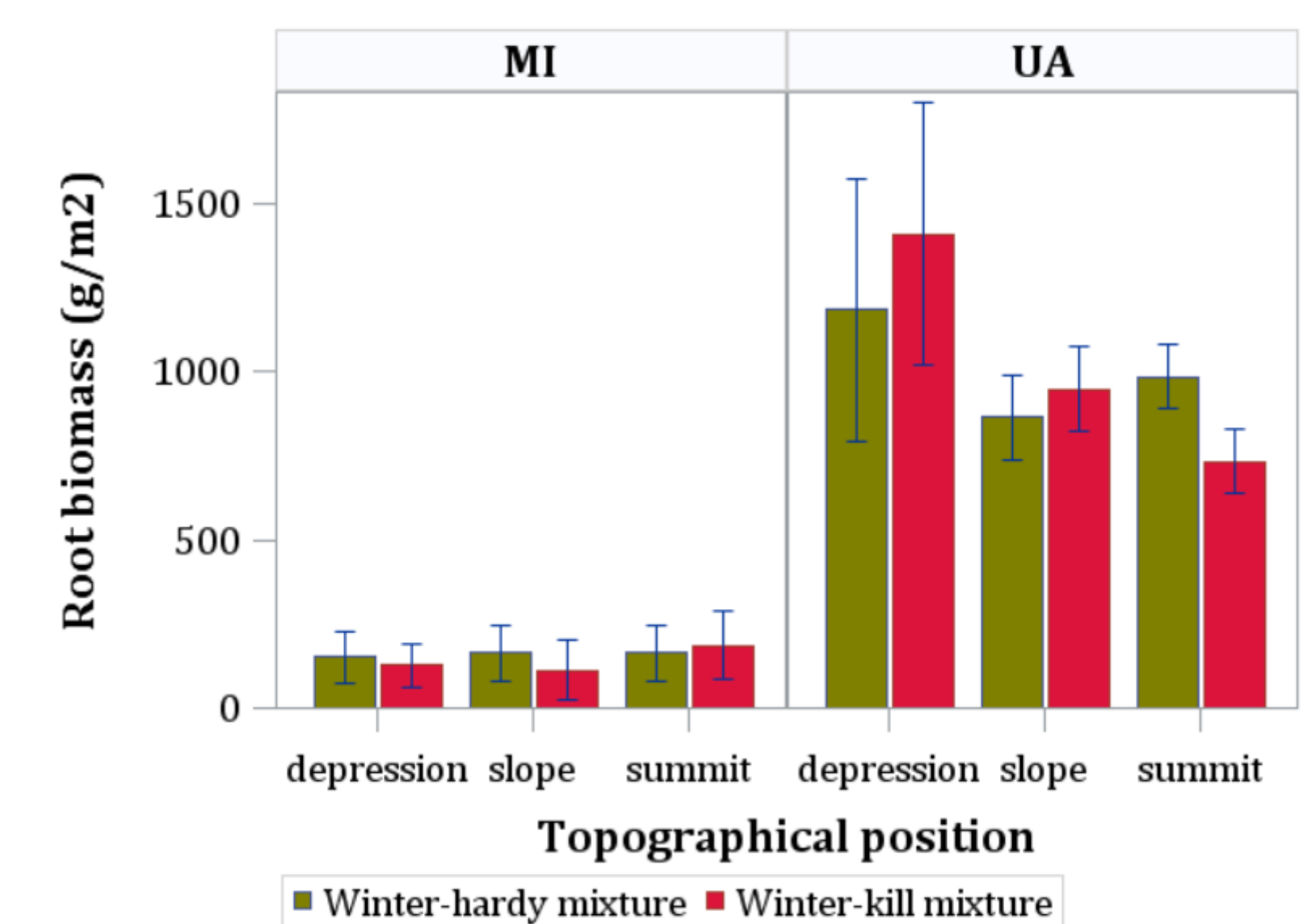
Fall WH cover crop biomass



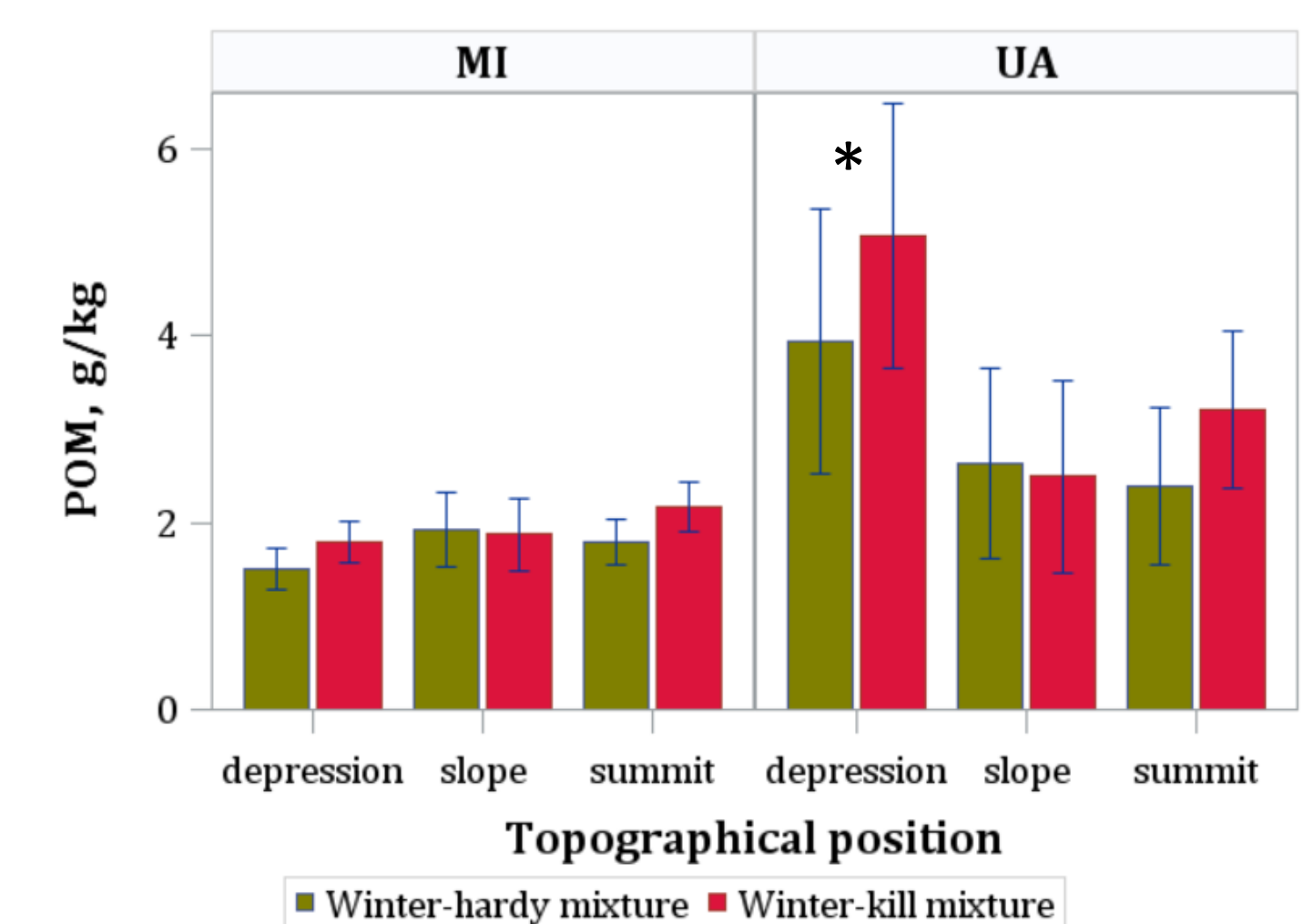
Fall WK cover crop biomass



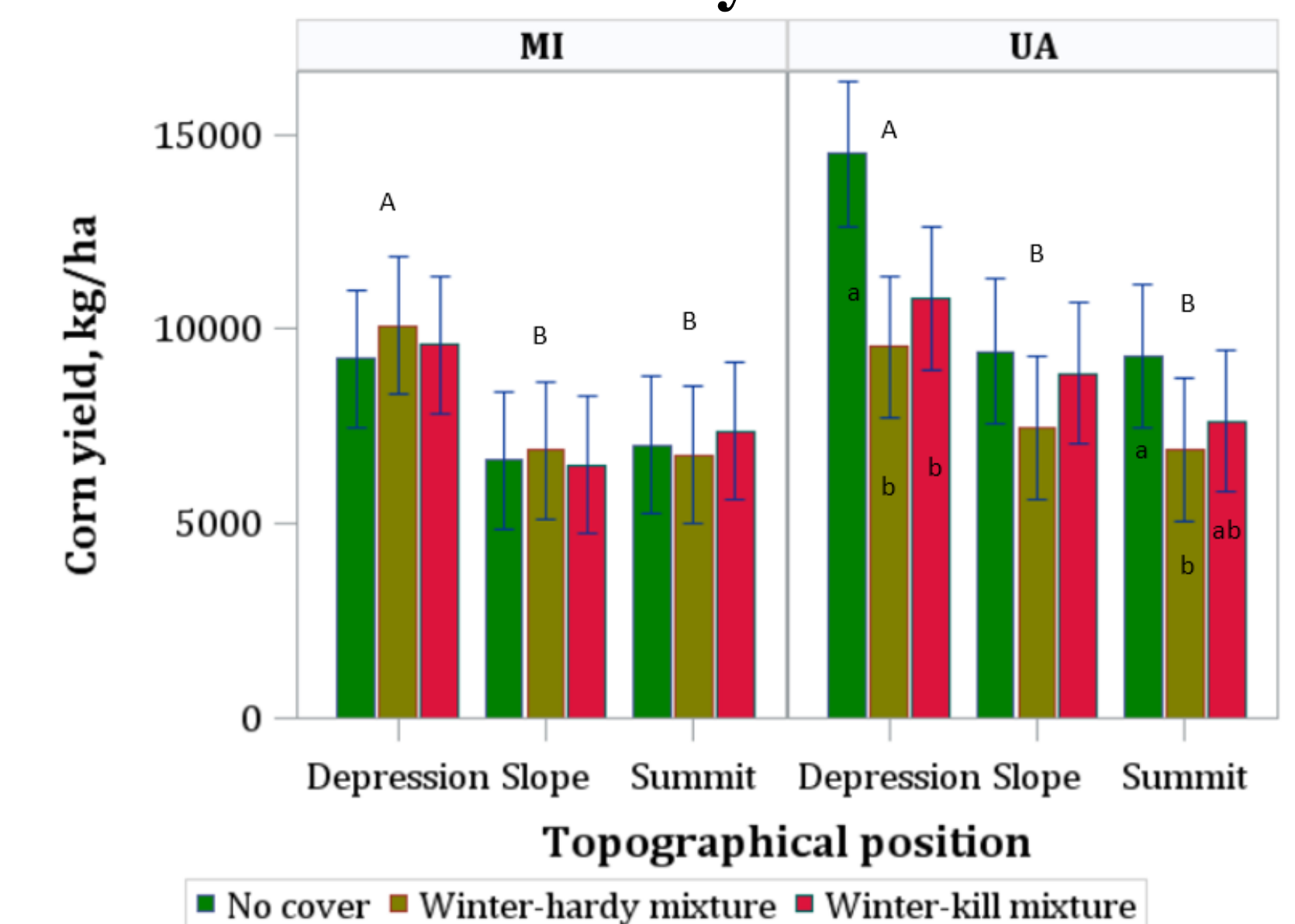
Below-ground biomass (0-30 cm)



Particulate organic matter (0-30 cm)



Corn yields



Uppercase letters mark significant differences among topographies, across all treatments. Lowercase letters mark significant differences among the cover crop systems within topographical positions ($p < 0.05$).

Conclusions

- Cover crops performed better in more fertile soils of Ukraine as compared to low SOM MI soils.
- Greater above- and below-ground biomass in Ukrainian sites was associated with greater soil POM levels.
- At topographical depressions in UA sites POM was higher under WK than WH system.
- Cover crops interfered with corn and led to lower corn yields in UA sites, likely due to combined effect of low moisture availability and too early cover crop planting.