Winter cover crop variety evaluation

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SJC and Delta Field Crops Meeting
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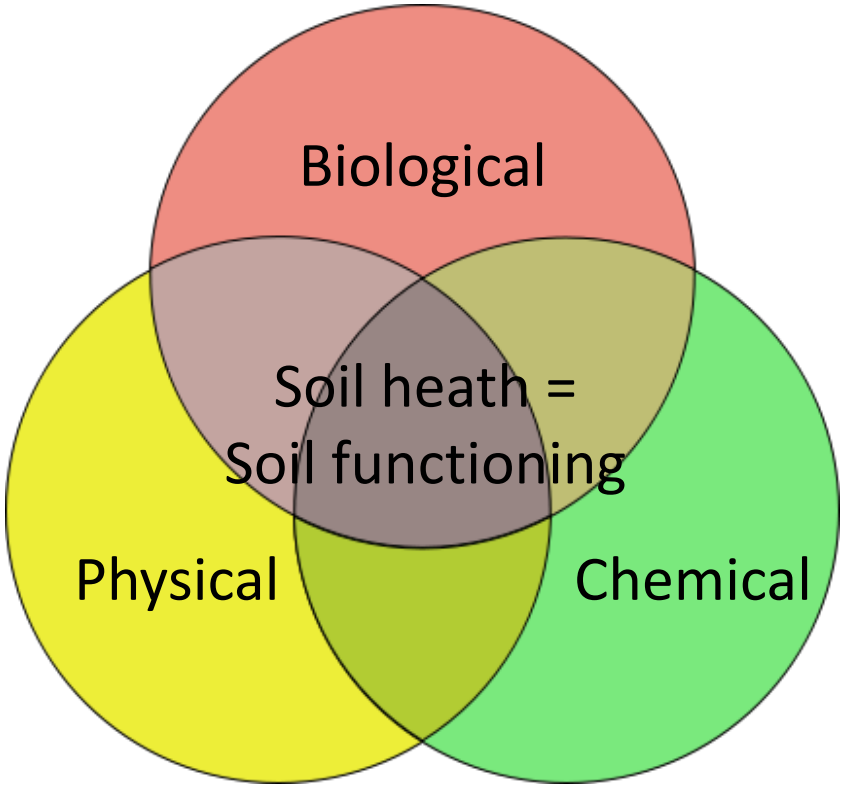
Project background and objectives

- Rice may be grown over multiple seasons without rotation.
- Typical winter management is to flood.
  - Helps with straw decomposition and pest management and provides waterfowl habitat.
- Cover cropping is not widely implemented in rice systems, particularly on soils with high clay content and/or limited drainage.
  - Challenges with terminating and incorporating cover crop biomass in time for rice planting.

Project background and objectives (cont.)

- Winter cover crops can introduce plant diversity and may confer other soil health benefits:
  - Increase soil organic matter
  - Reduce nitrogen leaching during the winter and/or inputs during the growing season
  - Improve rice straw decomposition
- We are evaluating how well different cover crop species:
  - Establish and provide soil coverage
  - Affect soil carbon and nitrogen dynamics
  - Impact rice yield in subsequent seasons



Methods

- Delta trial is on Staten Island
  - Rindge muck soil, approx. 28 percent organic matter
- Evaluating 10 single species and two mixes
- Hand broadcasting seed and then raking it in
- Plots are 200 ft^2 with four replications.
- This is a 3-year trial. CC planting dates:
  - November 30, 2022
  - November 13, 2023
  - November 12, 2024
- Other trial locations in Butte and Colusa

Seeding rates

Cover crop species	Seeding rate (lb/ac)
Balansa clover	18
Bell bean	180
Biomaster pea	72
Field pea	110
Oats	110
Purple vetch	72
Cereal rye	98
Turnip	18
Woollypod vetch	72
Yellow mustard	12

Cover crop mixes	Seeding rate (lb/ac)	% of mixture
Mix 1:		
Purple vetch	13	11
Bell bean	33	27
Field pea	30	25
Cereal rye	45	37
Mix 2:		
Purple vetch	20	21
Balansa clover	3	3
Field pea	38	40
Oats	25	27
Radish	8	9

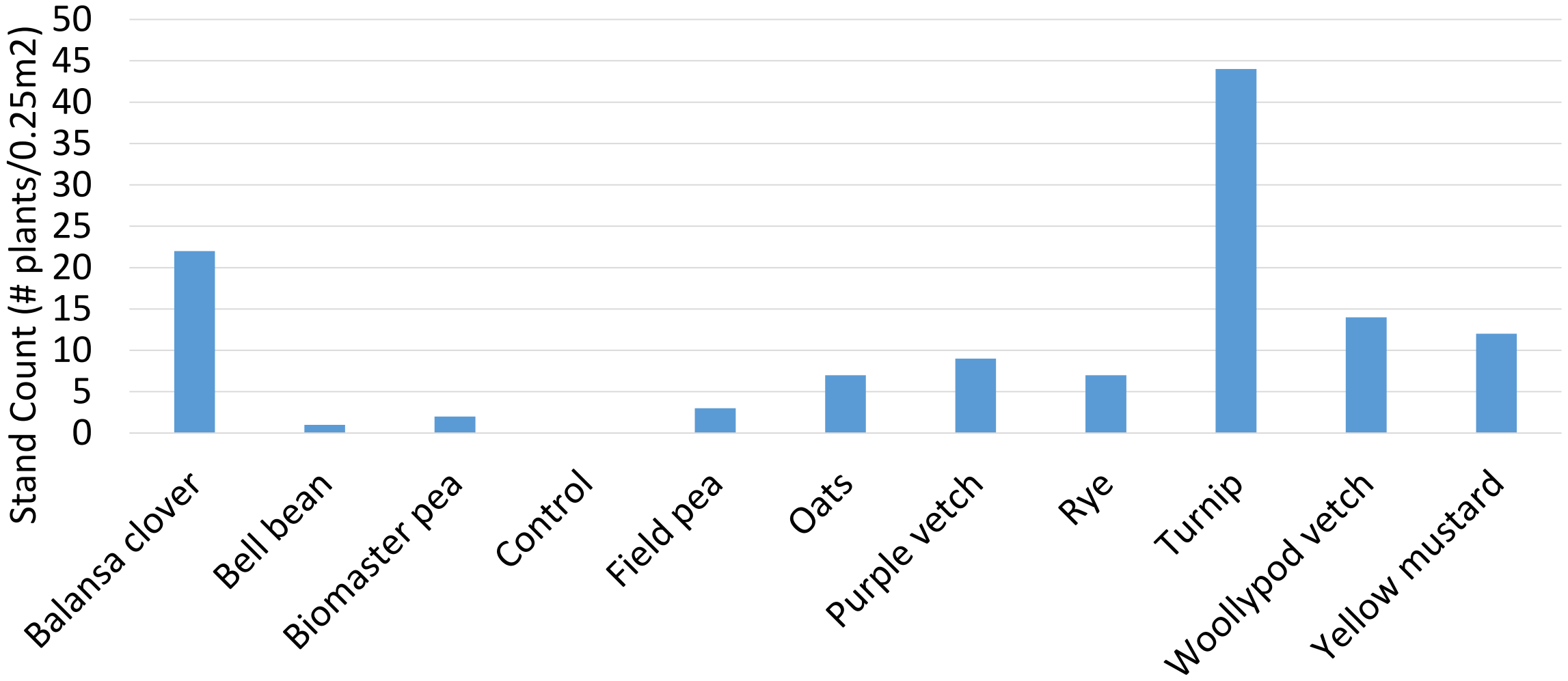
Year 1 (2022-23)

This was a challenging year for cover cropping. Seasonal rainfall started early in the fall, which delayed planting and challenged cover crop establishment. The Delta location received 3.5” of rain in the 10 days after planting, and seasonal rainfall exceeded 25”. Our data is extremely limited and not particularly meaningful.

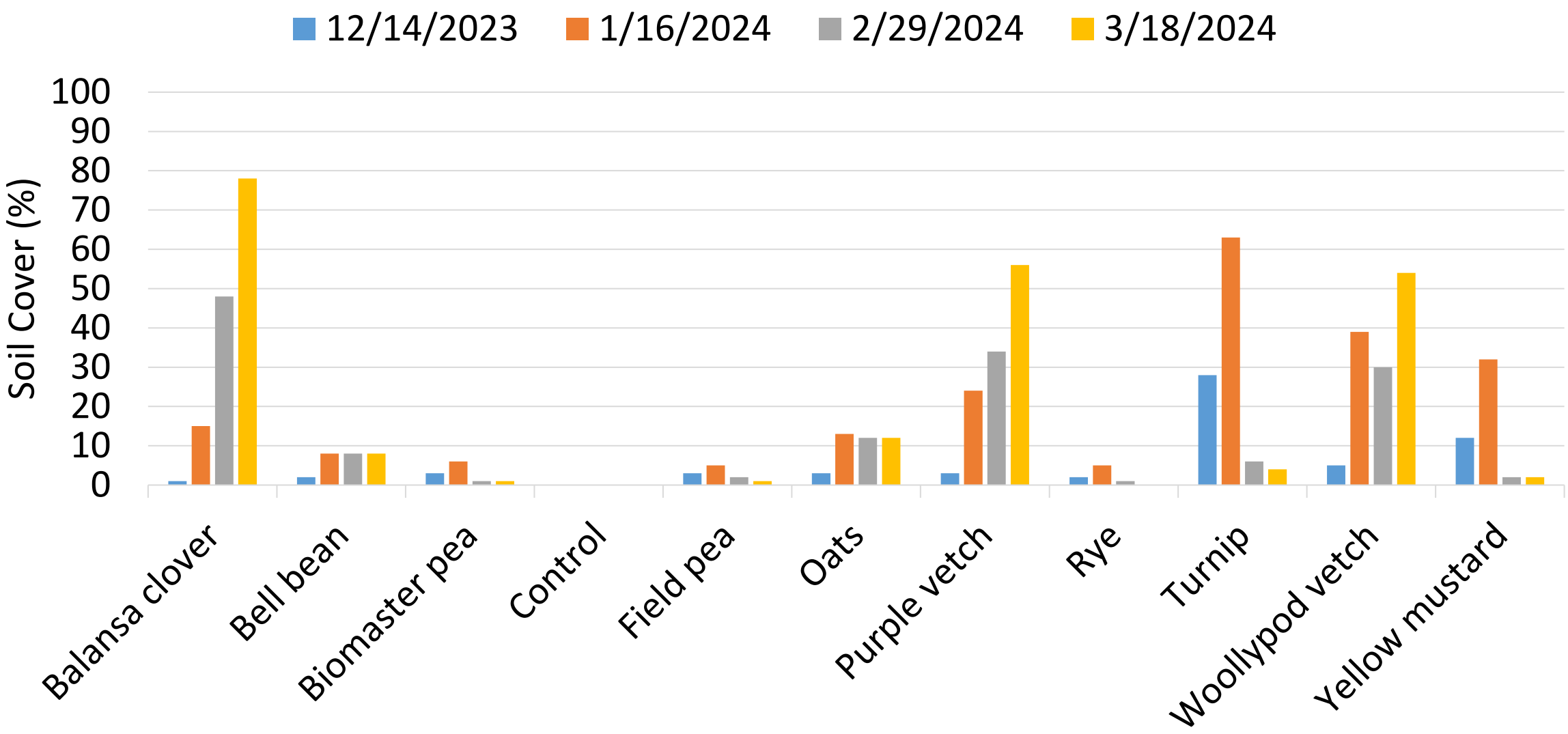
Year 2 (2023-24)

The winter started off fairly dry, so sowing was earlier, and germination was good for all species. The site received 0.2” of rain within a week of planting, and about 0.4” by mid-December. More frequent storms started in late December, and the trial field was adjacent to flooded fields. The combination of rain plus seepage meant the trial stayed quite wet after the new year.

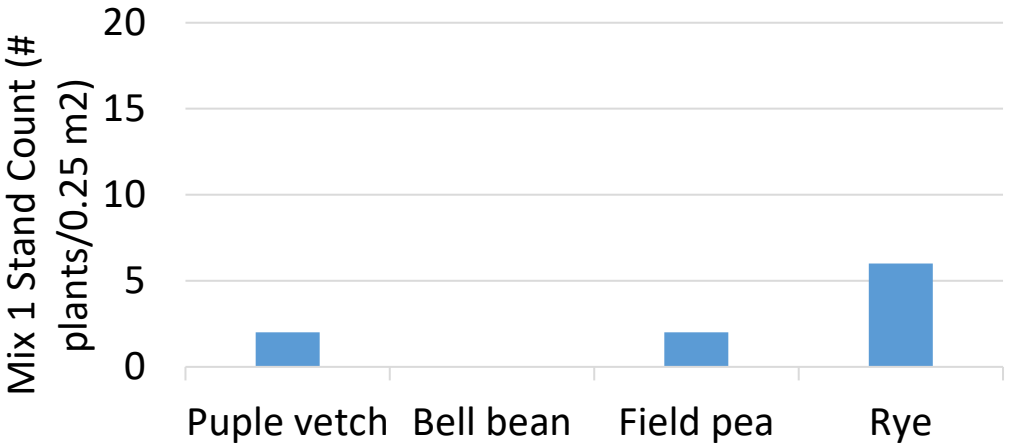
Plant stand one month after planting (12/14/23)

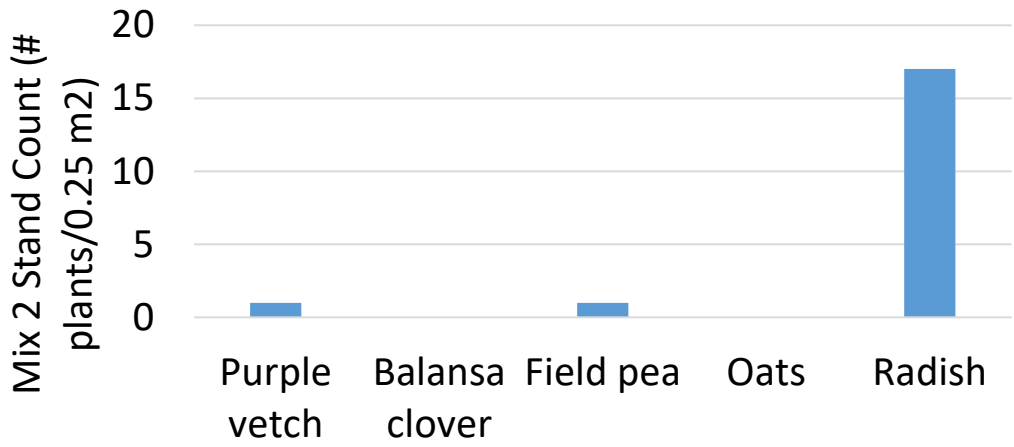


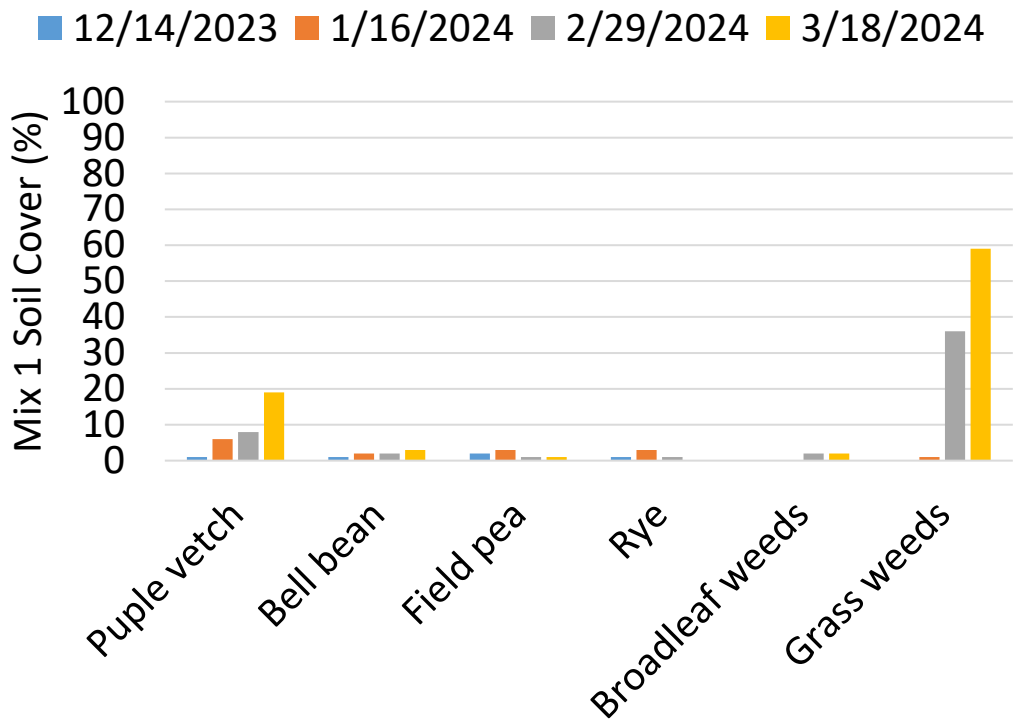
Soil coverage over the season

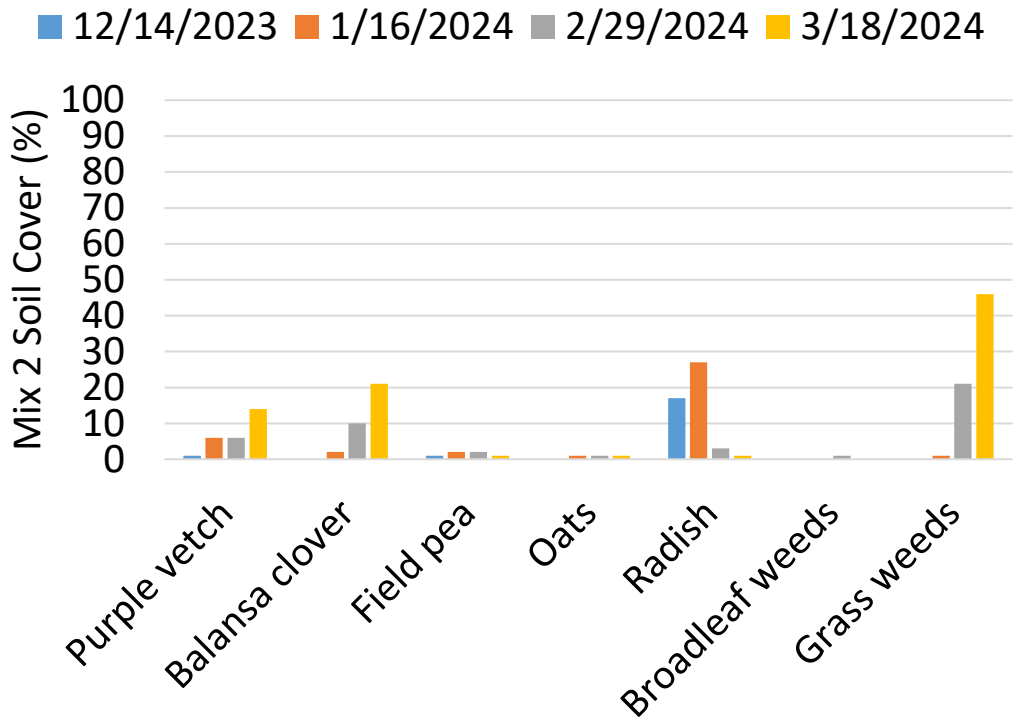


Mixes stand counts and soil coverage

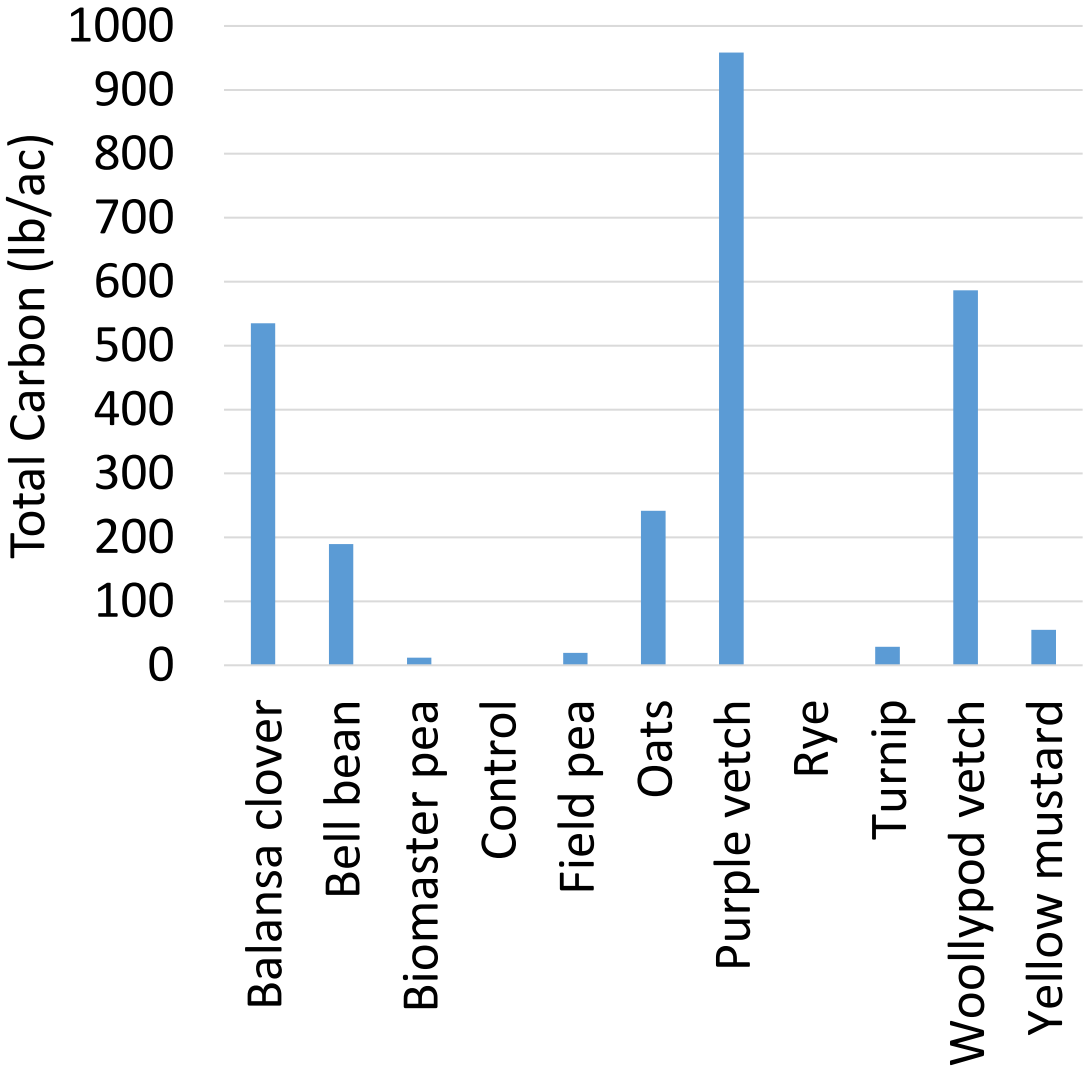


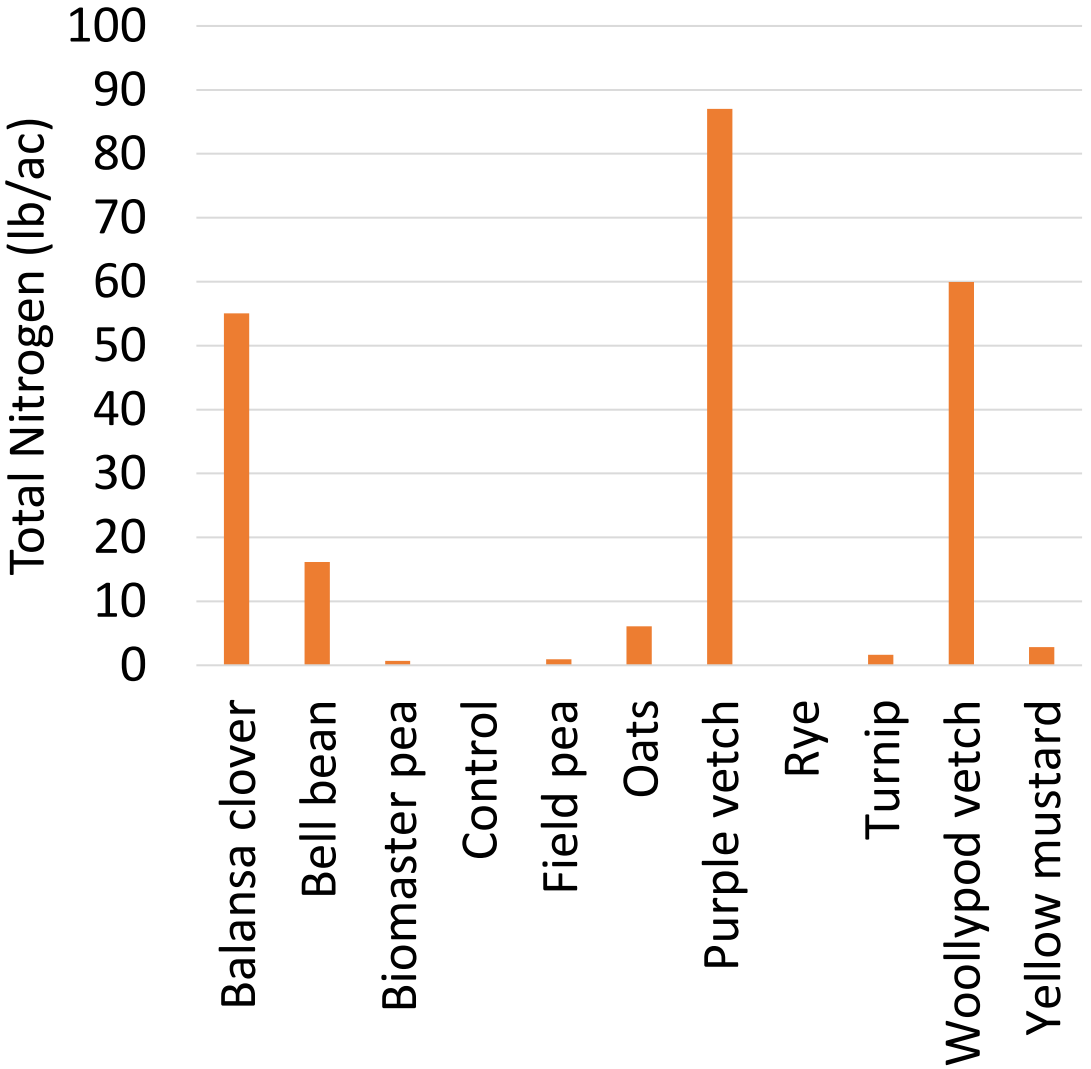




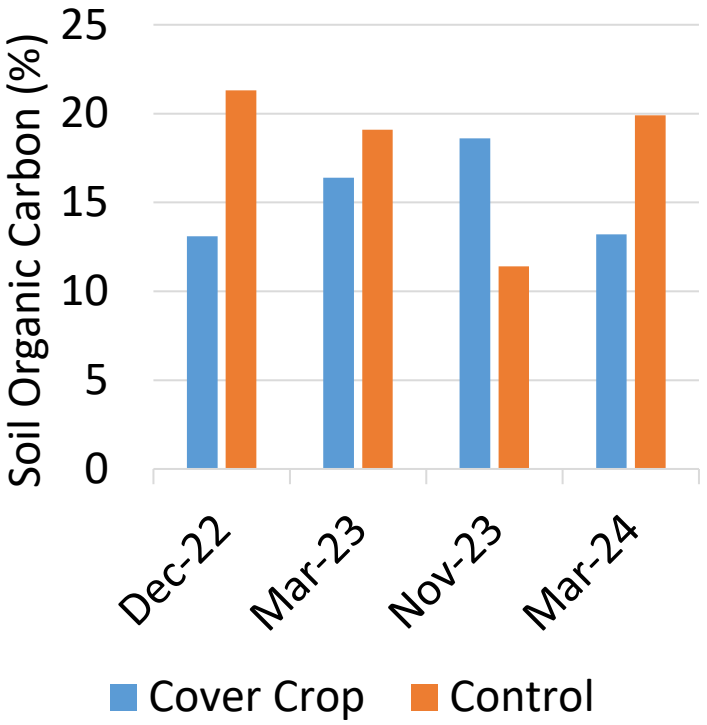


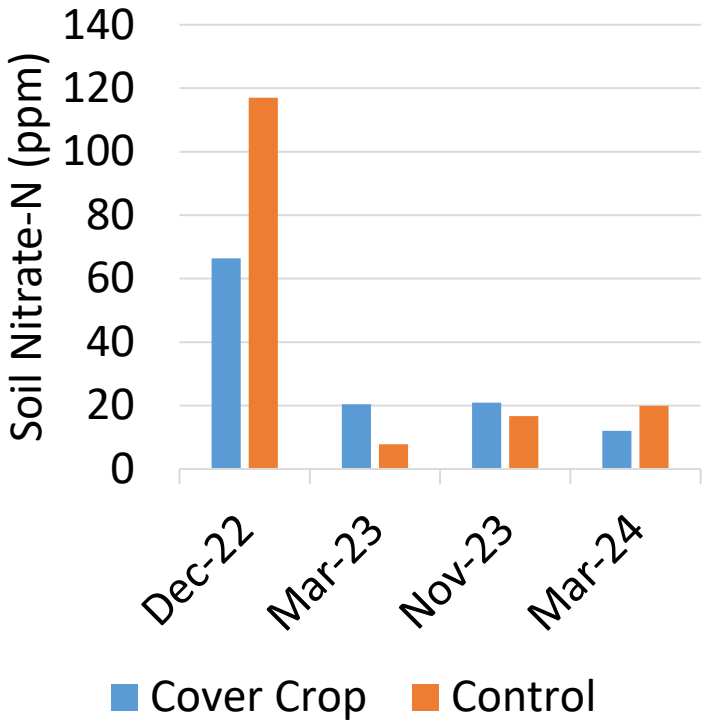
Biomass carbon and nitrogen (3/18/2024)

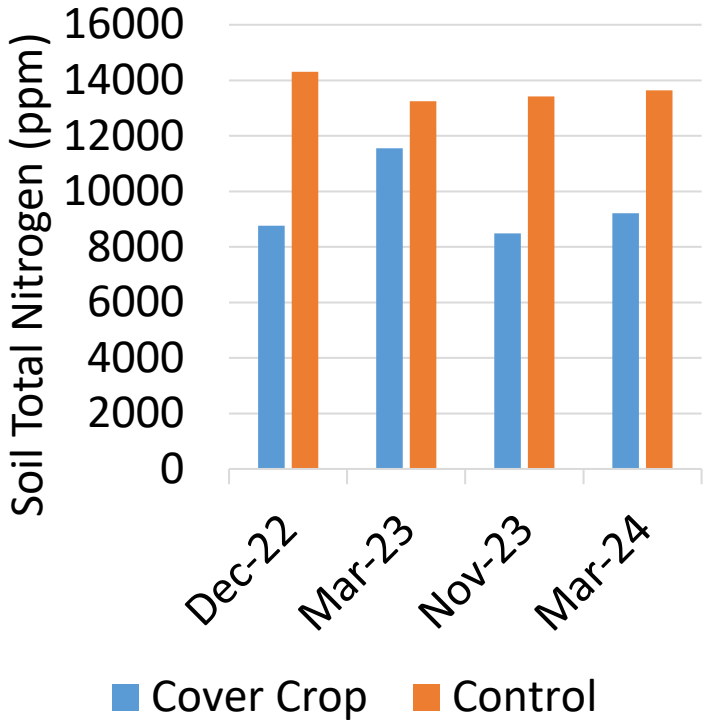




Soil analyses



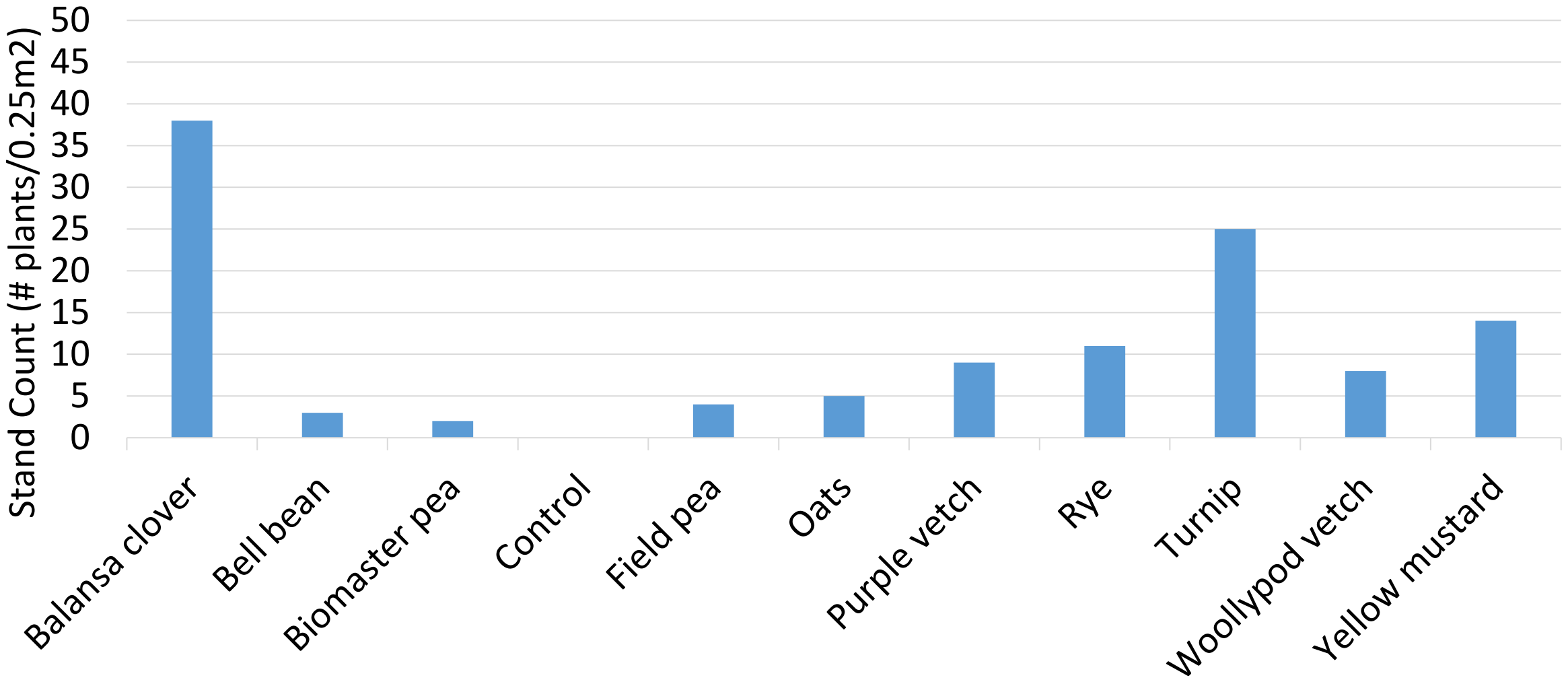




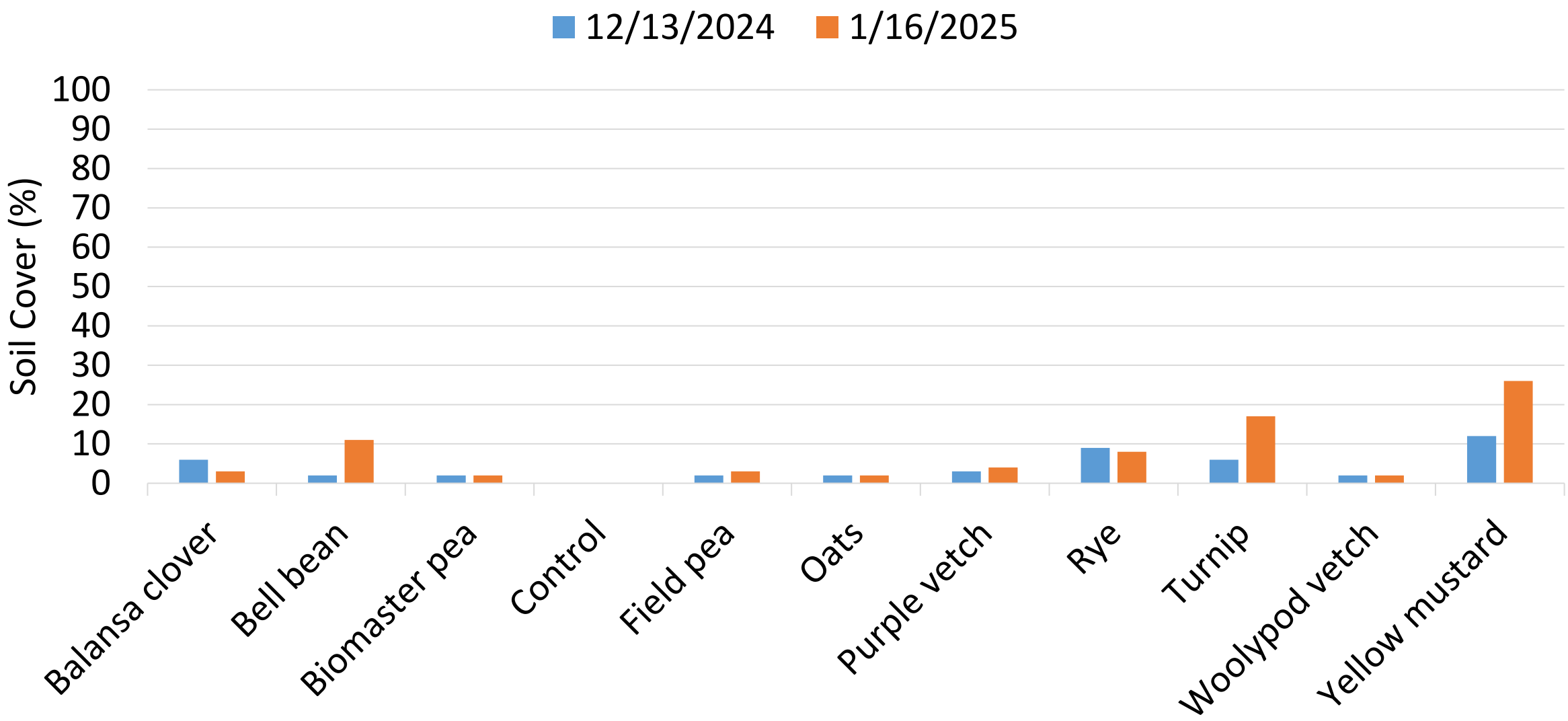
Year 3 (2024-25)

This season, a dry fall allowed for mid-November planting. Rain fell in late November and throughout December (approx. 4.75” total), and January has been dry. Germination was good. Bird feeding seems to be less.

Plant stand one month after planting (12/13/24)



Soil coverage over the season (so far)



Summary of results

- Brassica species established quickly but did not tolerate wet conditions.
- Legumes (vetches, bell bean, clover) provided the best soil cover at the end of the season.
  - They also had the highest carbon and nitrogen inputs.
- Soil carbon and nitrogen have been variable over time and may be more influenced by other site characteristics than by cover cropping.
- Cover cropping hasn’t impacted rice yield.

Lessons learned and grower guidance

- Timing is everything! Plant the cover crop in early to mid November for best success.
- Stand establishment is impacted by conditions outside the control of the grower.
  - Consider management that can improve success, like pulling drainage ditches.
- Drill-seeding provides for better stand establishment than flying on the seed and harrowing it in.

Lessons learned and grower guidance

- Bird feeding may be severe.
  - Birds seem to prefer grasses over legumes.
- Growers incur costs to cover crop.
  - Seed ranged from $0.49 to $1.92/lb
- Soil health outcomes may vary depending on the cover crop biomass obtained and other site-specific factors.
- The variability of soil health outcomes could hinder long-term practice adoption.

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