LIVING LAB - ATLANTIC

Soil building practices such as cover cropping and manure application can improve soil structure, alter nutrient cycling, and build cropping system resiliency, but may increase weed pressure and introduce novel weed seeds

Does manure and cover cropping alter the weed seedbank?

- Generally assumed, manure adds weed seeds and may increase weed pressure
- Soil amendments such as manure can alter crop-weed competition dynamics
- Cover crops can reduce the number of weed seeds returned to the seedbank by competing with weeds
- Perennial cover crops and reduced tillage can promote declines in annual weed populations

What we did

- Established 8, 3-year rotations (Table 1)
- Annual and perennial cover crops were sown in 2019 with and without 20 T ha^{-1} of cattle manure
- Sampled the weed seedbank each year in the spring and crop and weed biomass in summer during the cover crop phase

Table 1: List of 3-year rotations evaluated. Manure was applied in 2019 only.

2019	2020	2021
Barley u.s. Annual ryegrass	Sorghum f.b. Mustard	Potato
Barley u.s. Orchard grass & Alfalfa	Forage regrowth	Potato
Barley u.s. Orchard grass & Common vetch	Forage regrowth	Potato
Barley u.s. Annual ryegrass	Sorghum-sudangrass	Potato
Bromegrass, Orchard grass & Hairy vetch	Forage regrowth	Potato
Barley u.s. Red clover	Forage regrowth	Potato
Sorghum-sudangrass & Alfalfa	Forage regrowth	Potato
Barley u.s. Annual ryegrass	Pearl millet	Potato

Notes: u.s. – underseeded; f.b. – followed by

Fig 1: Example of three-year rotation of sorghum-sudangrass & alfalfa -> alfalfa forage regrowth -> potato

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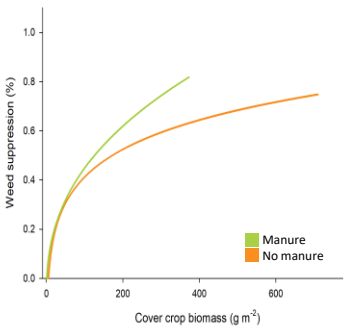

Fig 2: Relationship between cover crop biomass and weed suppression with (green) and without (orange) manure application.

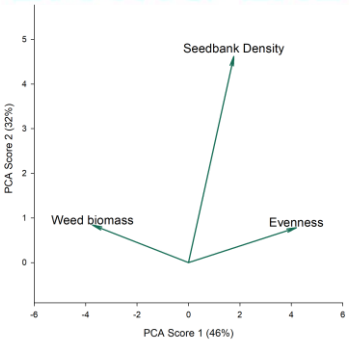

Fig 3: Relationship between weed seedbank density, weed diversity and in-season weed biomass. Vectors in opposite directions indicate negative correlation. Perpendicular vectors indicate no correlation.

What we found

- Manure added weed seeds and increased weed diversity
- Manure did not increase weed pressure but improved competitive ability of cover crops (**Fig 2**)
- Higher seedbank diversity was associated with decreased weed biomass in-season (**Fig 3**)
- Regardless of cover crop identity, weed seedbank density declined over time with the addition of manure (**Fig 4**)
- Manure alters nutrient availability in-season which may have species-specific effects on weeds

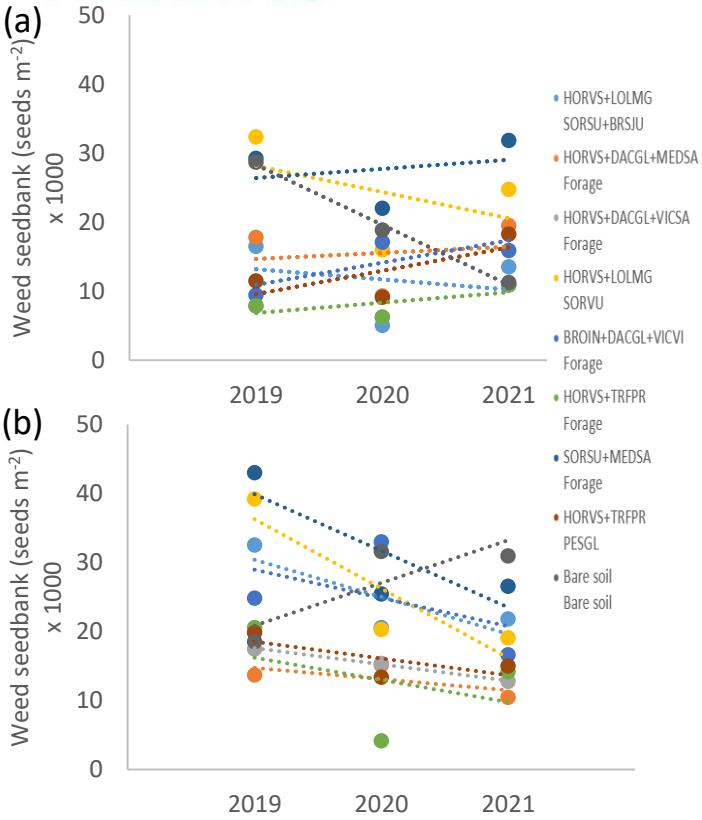

Fig 4: Weed seedbank density through time in (a) no manure and (b) manure plots. Treatments are labeled with EPPO codes.

Conclusions

- Manure can increase cover crop biomass and competitive ability, improving weed suppression to overcome the initial addition to the weed seedbank
- In the absence of herbicides, cover crops and manure can decrease weed pressure in subsequent seasons to support sustainable potato production

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