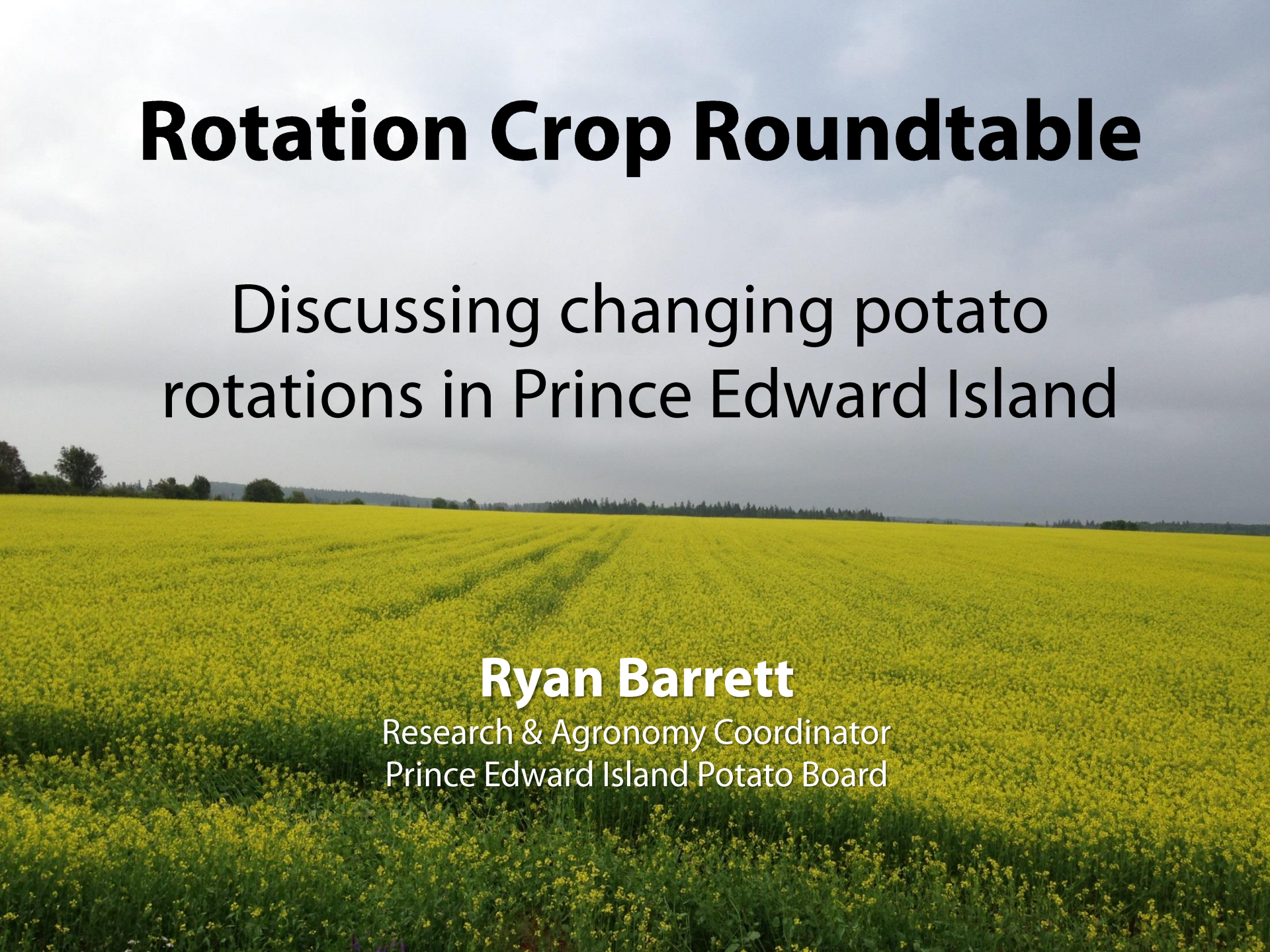
Rotation Crop Roundtable

Discussing changing potato rotations in Prince Edward Island



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Improving Soil Health

- In Prince Edward Island, we have seen a decrease in soil organic matter over the past two decades.

- Soil Organic Matter:
  - Increases water **holding capacity** and **CEC** of soil
  - Reservoir for **nutrients**
  - Reservoir for **beneficial microorganisms**

Soil Health: a Potato Definition

- For many potato producers, a healthy soil is not just good soil organic matter, good soil structure, and a healthy microbial community, but is also free from soil-borne pests and diseases
  - *Verticillum* and root lesion nematodes
  - *Streptomyces scabies* (common scab)
  - *Rhizoctonia*
  - Wireworm

Building Healthier Soils

- A number of soil-borne pests/diseases have limited chemical control options, or those options are unavailable in PEI (ie. fumigation)
- Organic amendments (ie. manure) are often unavailable or don't fit with food safety regulations
- Most Island growers are already used to growing non-commercial forage crops (ie. red clover) to feed the soil for the potato crop.
- So, tackling both of these challenges through use of rotation crops has rapidly increased.

Mustards

- Has been shown to be effective in reducing wireworm damage under double-cropping system (Noronha, AAFC)

- Other studies have shown beneficial effect on early dying complex, common scab, Rhizoctonia

Mustards

- Requires considerable tillage
- Requires water for biofumigation
- Requires adequate fertilization for maximum benefit
- Data from WSU has shown that mustards can host both *V. dahliae* and root lesion nematodes
- Can be used as a fall cover crop following wheat/barley/peas
- Brown vs. Caliente – depends on what you're trying to do!

Buckwheat

- Has also been shown to be effective at fighting wireworm, possibly without need for green manure incorporation.
- Fast establishment, weed fighter, soil conditioner, phosphorus scavenger, low fertility requirements, fighting root lesion nematodes

Buckwheat

- Not frost tolerant (poor fall cover crop choice)
- Needs to be planted into warm soil
- Considerations for white mold in tight rotations with other host crops
- Doesn’t regrow as well from mowing as mustard

Sorghum Sudangrass

- Trap crop for Verticillium
- Builder of soil organic matter
- Root system doubles after first mowing, compaction fighter
- Can be underseeded with forage (ie. alfalfa)
- Soil conditioner, easy tillage following sudangrass

Sorghum Sudangrass

- Inconclusive results on whether it multiplies nematodes
- Warm season crop, can't be planted until mid-June (weed mgmt)
- Don't let it get too mature (woody) or it can tie up N

Forage Pearl Millet

- Literature from Quebec showing effect on reducing RL nematode populations (Belair et al. 2005)
- Similar management to sorghum sudangrass, good for soil OM and soil structure, similar growing season
- Can be grown in mixture with sorghum sudangrass (50/50)

Sudangrass/Pearl Millet

- Still have a lot of questions about beneficial effect on reducing Early Dying symptoms, improving yield under local conditions
- Research by Mario Tenuta in MB in 2008 showed that *Verticillium* numbers might not noticeably decrease in soil samples, but disease incidence went down and yield increased.

Tillage Radish

- Growing acreage in PEI in 2017 & 2018
- Establish in August following wheat, barley, peas, or biofumigant crop
- Large taproots to break compaction layers, improve water infiltration, prevent nitrate leaching
- Somewhat frost tolerant, breaks down easily in spring

Tillage Radish

- No data on yields/disease incidence following tillage radish
- Host for Verticillium and nematodes?
- Consider seeding along with a grass crop for better C:N ratio

Multi-species mixtures

- Much to be learned on how different mixtures may help with some soil health attributes but may not help with others.
- How diverse is necessary?
- Multi-year mixtures to reduce tillage?

- PEI Potato Board & AAFC rotation trial (Aaron Mills) comparing 2 species (SS + FPM), 5 species (SS, FPM, BW, Mustard, Faba), and 12 species mixture in potato rotation. Started in 2018

Some Recommendations

- **Try one or two fields first** before making a large change to rotation crops. **Include a check strip!**

- Match the needs of the field with the strengths/weaknesses of the rotation crop.

- Do *Verticillium* and nematode testing when nothing actively growing in the spring to get the most accurate measurement of year over year effect of crops on pop'ns

- Same goes for soil OM – big difference between spring and fall conditions on numbers

Some Recommendations

- If trying to build or maintain soil **OM…consider the amount of tillage in rotation**, and whether there is an opportunity to reduce tillage passes.

- **Use of fall cover crops** to build soil OM is gaining traction, but important to understand effects on soil-borne diseases and pests.

Evaluating Mustard & Buckwheat

Rotation	Total Yield (cwt/ac)	Market. Yield (cwt/ac)	WW Damage (holes/tuber)
P – W Wheat – Soy	353.7	**273.8**	2.0
P – BW – BW	420.1	**337.1**	0.3
P – Mus – Mus	470.0	**404.5**	0.3
P – Mus – BW	450.7	**409.1**	0.2
P – Fallow – Fallow	371.4	**271.8**	0.1
P – Fallow – Mus	387.9	**324.8**	0.6

Yields adjusted to 7 plants/10 ft row. Graded to Canada #1

Prince Edward Island PEI POTATOES

Evaluating Mustard & Buckwheat

Rotation	Spring RLN (#/kg soil)	Fall RLN (#/kg soil)	Spring V. dahliae (cells/g)	Fall V. dahliae (cells/g)
Wheat – Soy	200	420	1680	**10384**
Mus – Mus	180	940	1469	2065
BW – BW	360	280	697	1833

Testing before potato planting and at potato harvest

Not much difference in nematode numbers but big difference in Verticillium