

AIM UPDATE

Update on AIM Projects and Grower Consultation

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PEI Potato Board



Agenda

- Review of Ongoing Trials/Projects
- Future Projects for Grower Participation
- Grower Consultation



Review of Ongoing Trials/Projects

- Whole Seed vs. Cut Seed (Steve Watts)
- Seed Generation Trial
- Site-Specific Soil Management (Dr. Aitazaz Farooque)
- Benchmarking Project
- One Pass Hilling vs. Row Forming
- Building Soil Organic Matter
- Soil Microbial Communities
- Early Dying – Survey Results
- Ethylene Trial



Whole Seed vs Cut Seed

- Steve Watts, Genesis Crop Systems



Seed Generation Trial

- Assessing whether planting an earlier generation of seed improves marketable yield.
- Had to identify seed growers with multiple generations of seed of the same variety.
- By getting seed from the same source with the same management/growing conditions, hopefully leave generation as only variable.
- Was only able to set up two trials in 2017, and one was not able to be harvested.



Seed Generation Trial

Russet Burbank: E2 vs E3

Same seed source, clear virus rating

Seed stored and managed the same in previous year.

	Elite 2	Elite 3
Total Yield	277 cwt/ac	382 cwt/ac
% Smalls	12%	19%
% > 10 oz	3%	2%
Specific Gravity	1.092	1.089
Pay Yield	251 cwt/ac	318 cwt/ac
Total Payout	\$2,775	\$3,474

Seed Generation Trial

Moving Forward

- Proposal to acquire seed in 2018 and contract a grower to grow out 3 generations in same field this year to plant in 2019.
- Looking at planting E2, E3, E4 Russet Burbank in 2019
- Any interested seed growers can contact me!



Site-Specific Soil Management

- Dr. Aitazaz Farooque
UPEI School of Sustainable Design Engineering



Benchmarking Project

- Providing quality data back to producers to show how they compare to the grower group on deliveries for:
 - **Specific Gravity**
 - **% 10 oz**
 - **% Smalls**
 - **Colour**
 - **% Total Defects**
- Started sending out 2016 graphs this fall. Contact me if you haven't received those graphs yet.



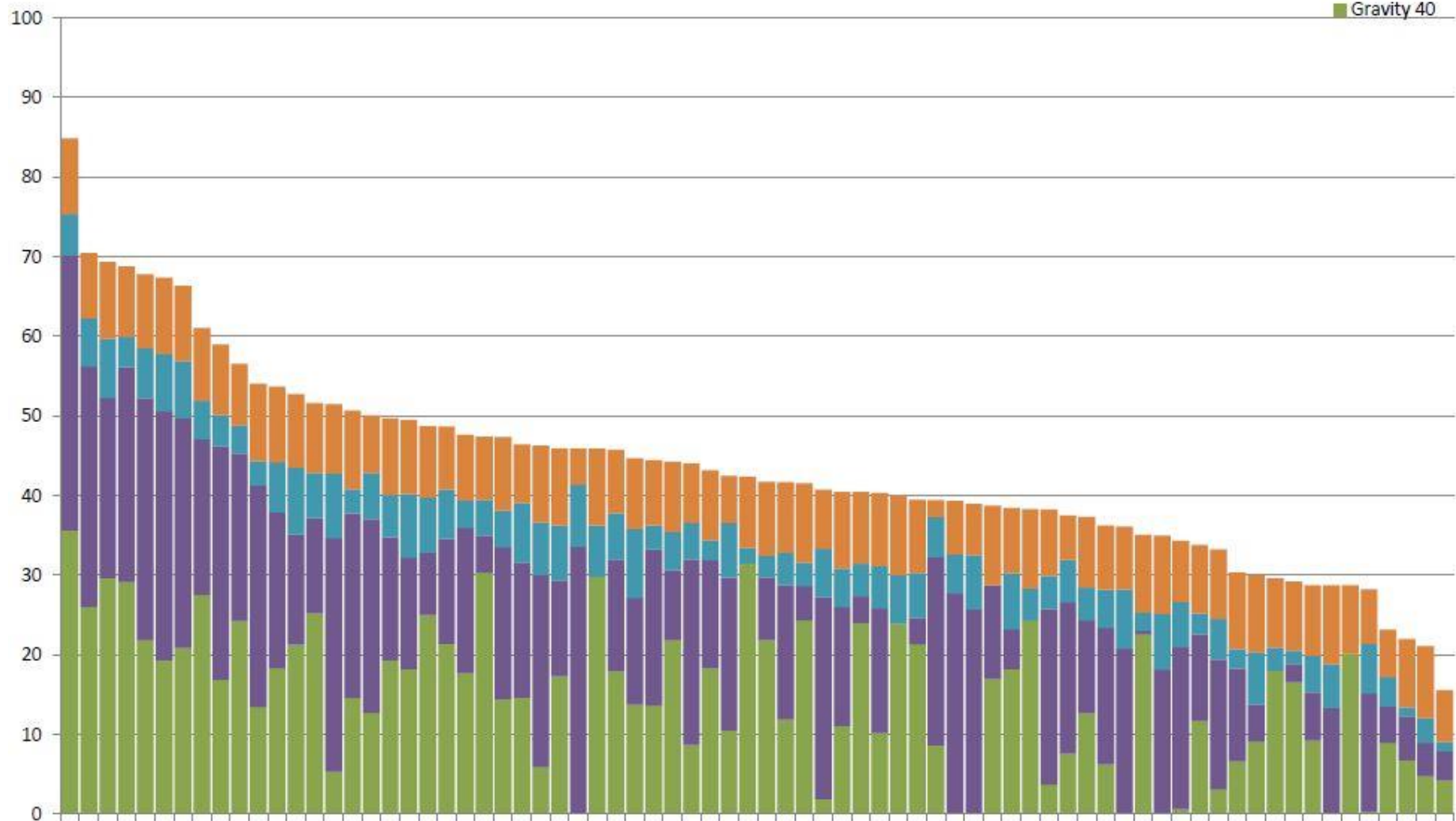
Benchmarking Project

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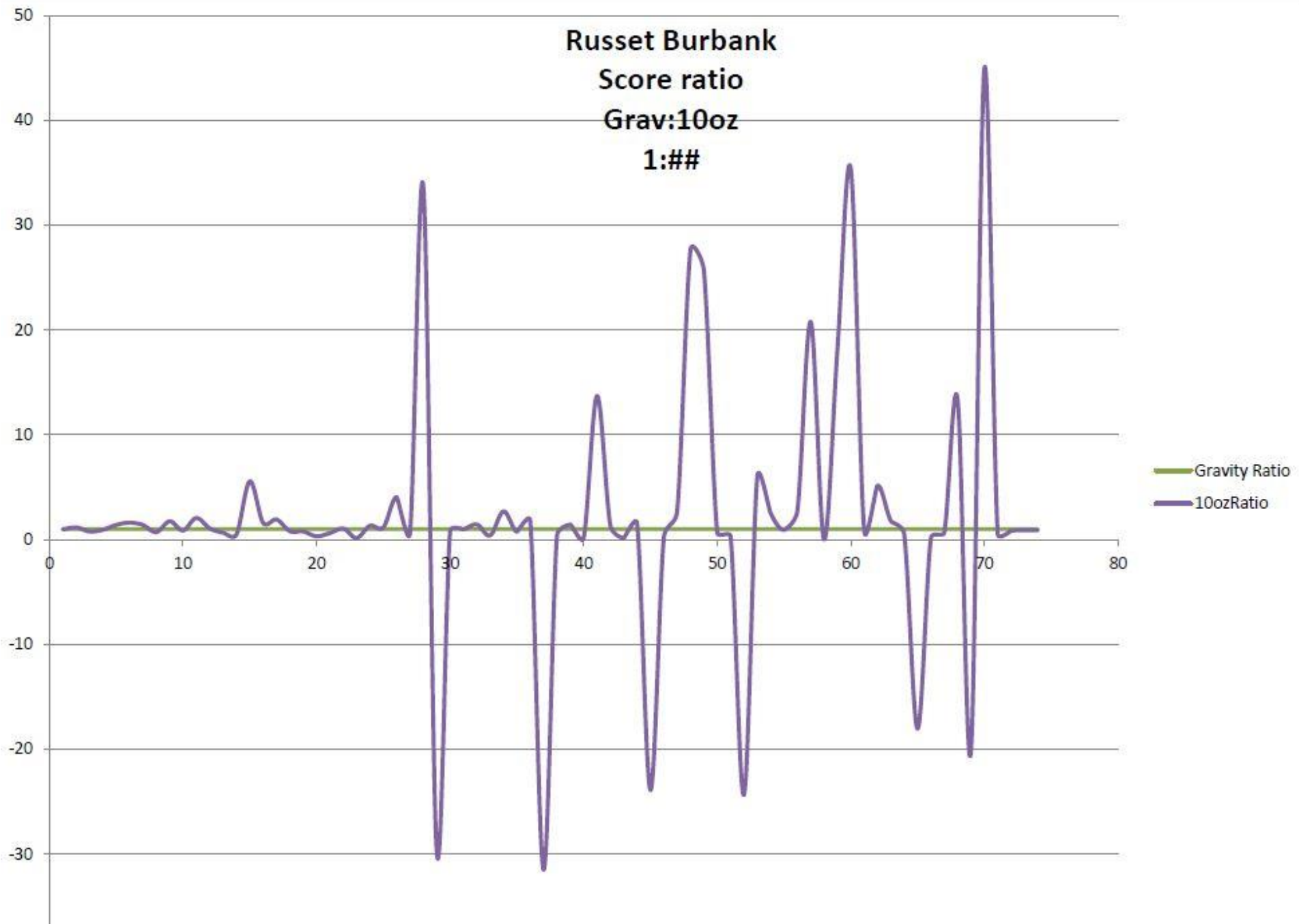


Winter Russet Burbank - Indexing
Crops:14/15 - 15/16
Maximum Score = 100

- Color 10
- Smalls 10
- 10oz 40
- Gravity 40

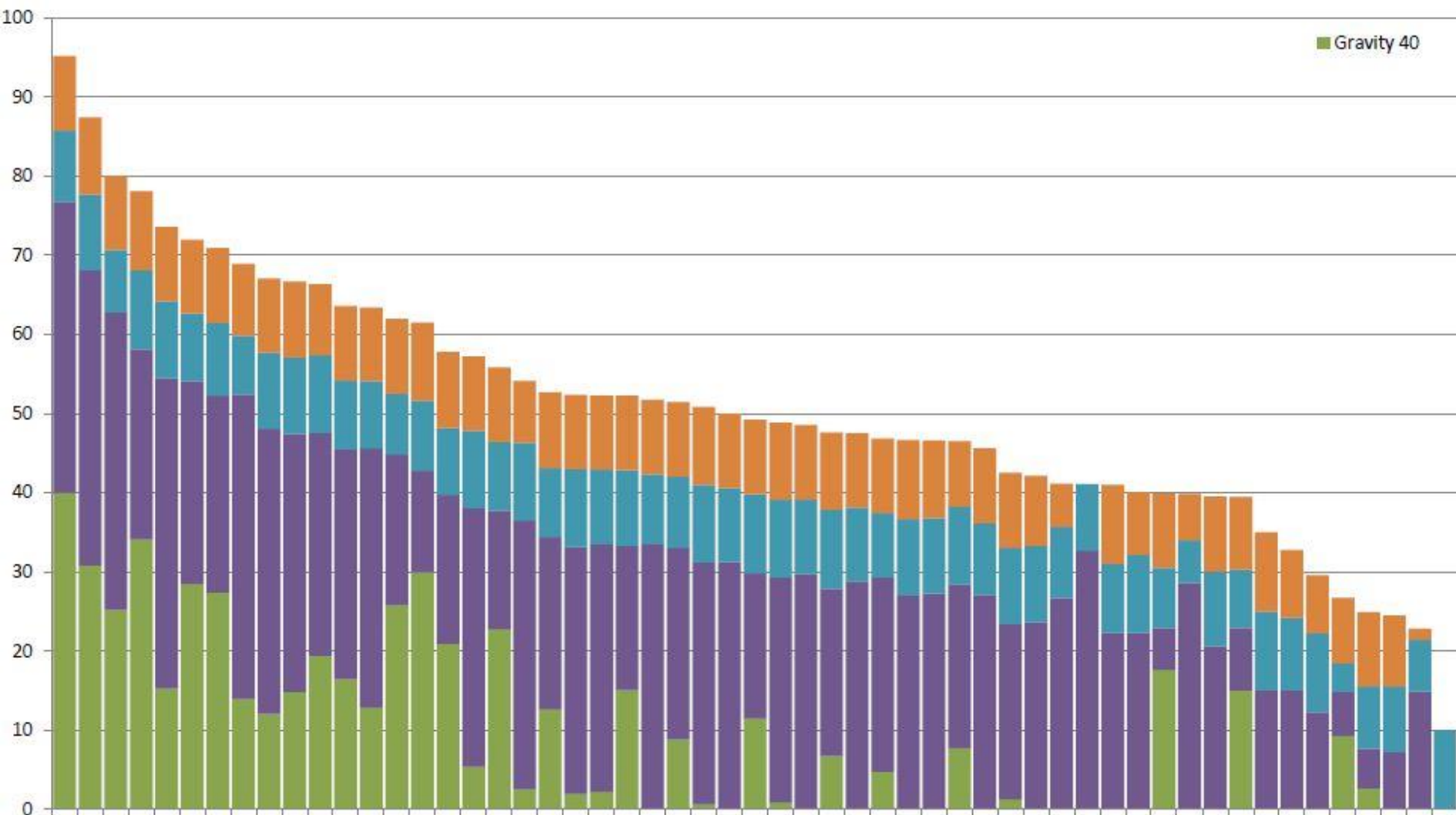


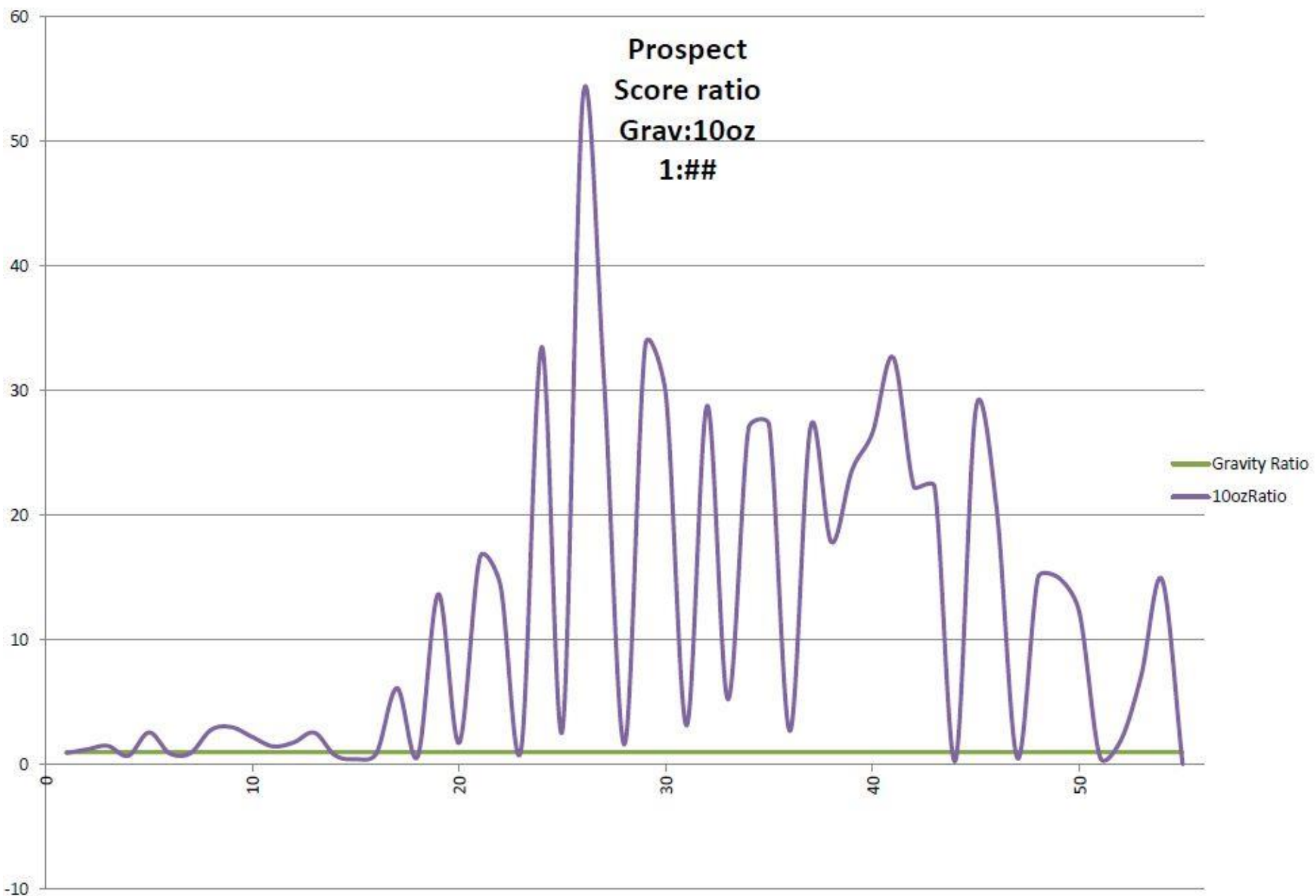
Russet Burbank
Score ratio
Grav:10oz
1:##



Winter Prospect- Indexing
Crops:14/15 - 15/16
Maximum Score = 100

- Color 10
- Smalls 10
- 10oz 40
- Gravity 40





Benchmarking Project

- Have then been interviewing growers to dig into production practices a bit more, see if I can identify any trends.
- Have interviewed growers at all ends of the spectrum for quality/yield.

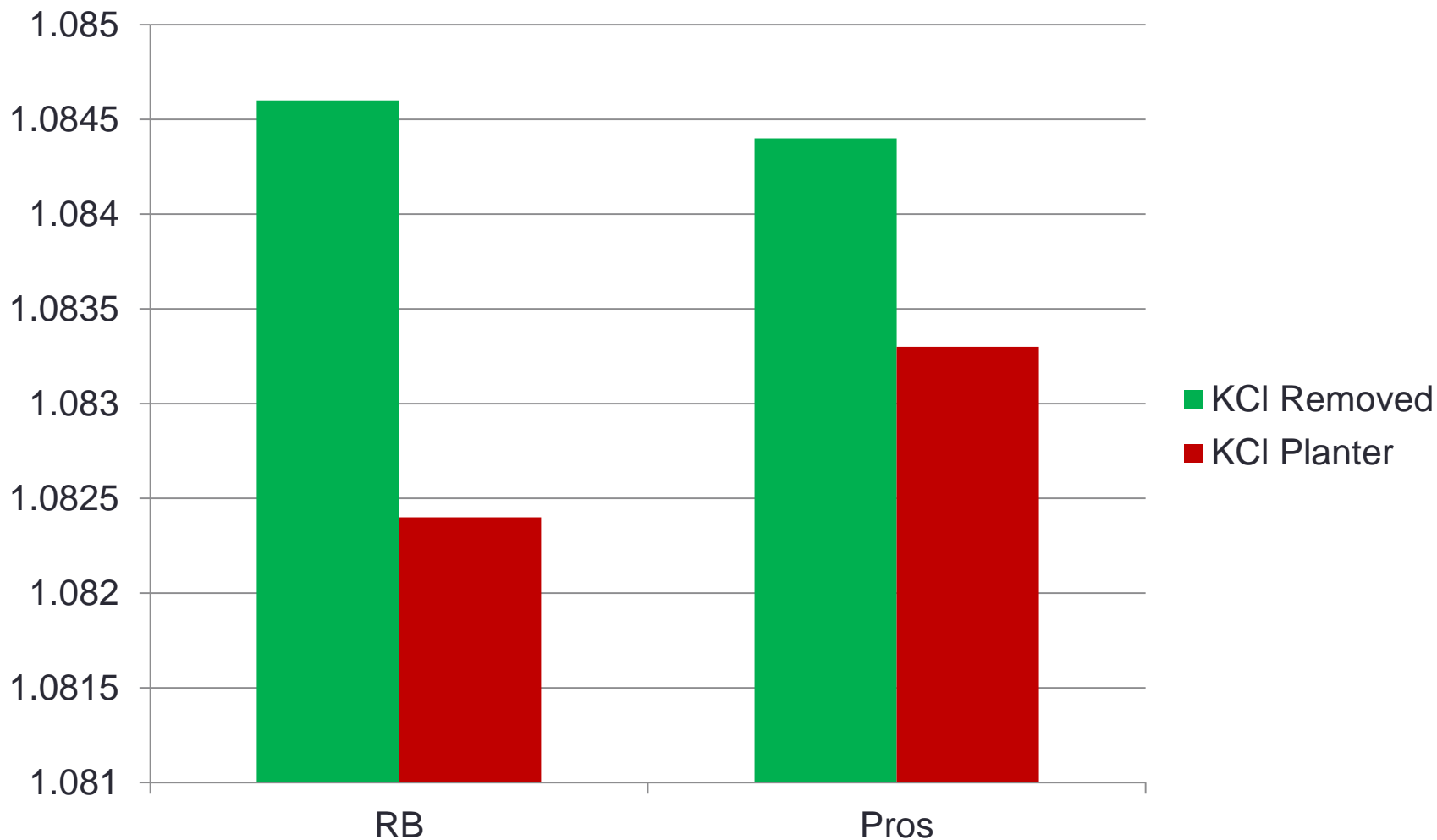


Benchmarking Project

A few trends so far:

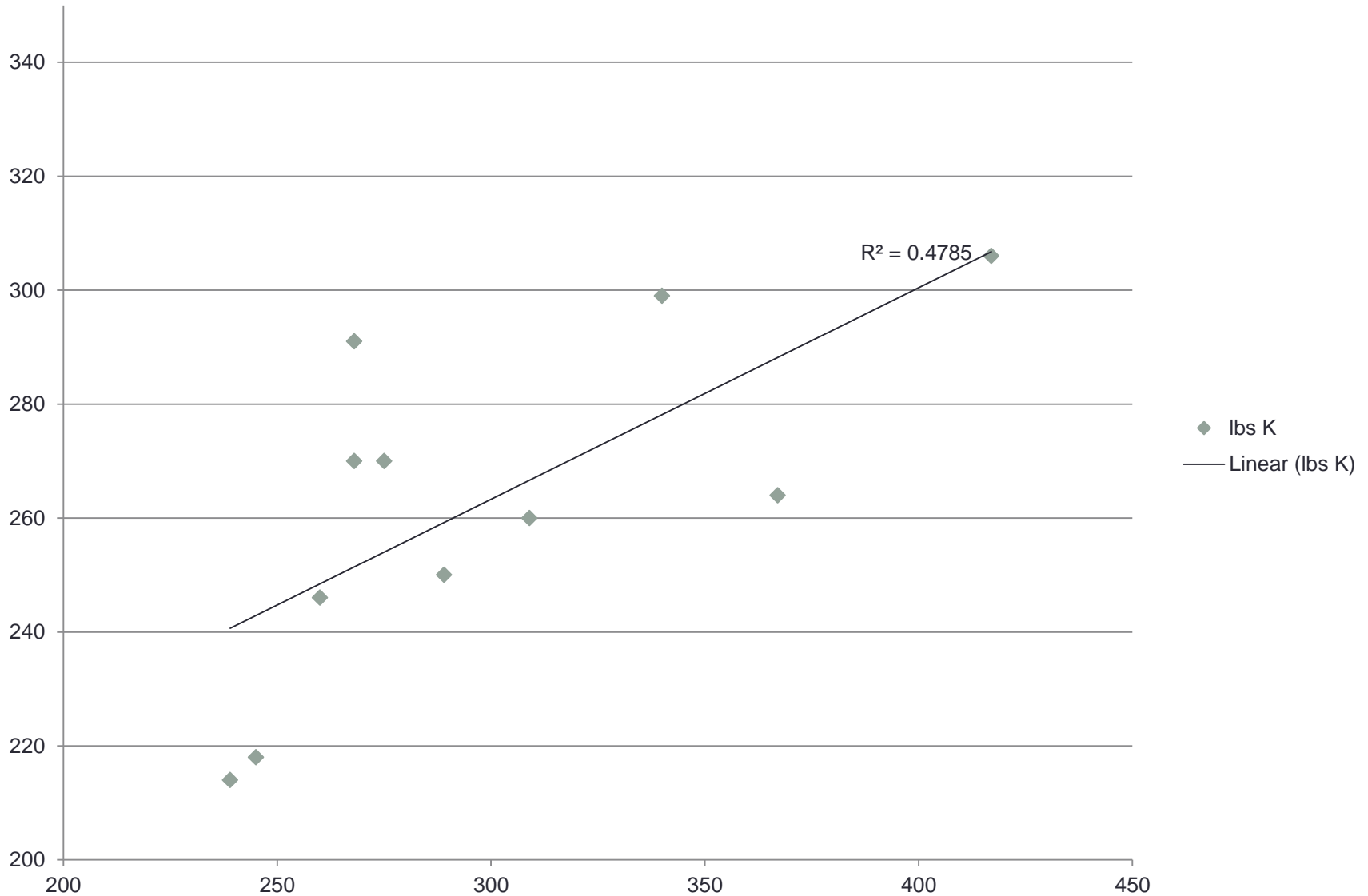
- More growers are moving lime application to earlier in rotation (on grain stubble or on forage crop)
- No real trends seen on planting/harvest date.
- In general, higher yields with higher total K rates
- Specific gravity trending higher on farms reducing amount of KCl at planting





Comparing 2016 data on farms where KCI has removed completely or in large part from the planter blend versus farms with primarily KCI in the planter

Comparing Total K rate with Pay Yield 2016 Russet Burbanks



Benchmarking Project

Moving Forward

- Contact me if you want to participate and you haven't already
- Contact me if you haven't seen 2016 graphs yet
- Will try and add more farms to the database as time allows.



One Pass Hilling vs Row Forming

- Does use of one-pass basket hillers on planter/immediately after planting have an effect on yield and quality?
- 2016: Island Holdings and MWM Farms
- 2017: Island Holdings



One Pass Hilling vs Row Forming

2016 Island Holdings

- Difference in one field, Russet Burbank. Planted May 20, Row Forming June 4th. Baskets vs. Row Forming
 - **Pay Weight: +18 cwt/acre**
 - Sunburn: +3.0%
 - Unusable Roughs: -3.7%
 - % Smalls: -5.6%
 - % 10 oz: +14%
 - Specific Gravity: +0.004
 - Payable per acre: +\$350



One Pass Hilling vs Row Forming

2016 MWM

- Difference between Hilled at Planting and Row Formed 3 weeks after planting (RB & Ranger)
 - Total Weight: +14.2 cwt/ac
 - Total Rot: -0.1%
 - Sunburn: +1.2%
 - Hollow Heart: +1.0%
 - Specific Gravity: +0.002
 - % Smalls: +1.5%
 - % > 10 oz: -4.3%
 - **Pay Weight: -0.2 cwt/ac**



Building Soil Organic Matter - Rotation

- Research with Drs. Judith Nyiraneza and Tandra Fraser, AAFC Charlottetown
- Looking at the effect of different cover crops in terms of building soil organic matter as well as effect on potato yield.
- 2017: Cover crops planted and managed
- 2018: Potatoes
- Plot trial at Harrington. Half of the plots involved beef manure at 20 T/ha wet weight



Building Soil Organic Matter - Rotation

- Bare ground
- Alfalfa/orchardgrass (cut 2x)
- Sorghum sudangrass (cut 2x)
- Red Clover (cut 2x)
- Ryegrass/Common Vetch/Crimson Clover (cut 2x)
- Forage Pearl Millet (cut 2x)
- Sorghum Sudangrass/Alfalfa (cut 2x)
- Winter Rye/Hairy Vetch (cut 2x)
- Forage Sorghum followed by Brown Mustard (cut 3x)



Alfalfa/Orchardgrass – Fertilizer (Seeded June 8-9)

29-June-2017



10-July-2017



2-October-2017

First cut: 19-Jul
Second cut: 2-Oct



Sorghum Sudan Grass - Fertilizer (Seeded June 8-9)

29-June-2017



10-July-2017



2-October-2017



First cut: 19-Jul
Second cut: 2-Oct

Red Clover - Fertilizer (Seeded June 8-9)

29-June-2017



10-July-2017



2-October-2017

First cut: 19-Jul
Second cut: 28-Aug
Third cut: 2-Oct



Ryegrass-Common Vetch-Crimson Clover (Seeded June 8-9)

29-June-2017



10-July-2017



2-October-2017

First cut: 19-Jul
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Forage Pearl Millet (Seeded June 8-9)

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Sorghum Sudan Grass-VR Alfalfa (Seeded June 8-9)

29-June-2017



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First cut: 19-Jul
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Winter Rye-Hairy Vetch (Seeded June 8-9)

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Forage Sorghum followed by brown mustard (Seeded June 8-9)

29-June-2017 – Forage
Sorghum



10-July-2017 – Forage
Sorghum



2-October-2017 - Brown Mustard



First cut: 19-Jul
Second cut: 17-Aug
Third cut: 2-Oct

Building Soil Organic Matter

- Waiting on analysis of one year soil OM, not expected to be large changes.
- 2018 will be planted with potatoes, assess yield, Verticillium, nematodes, wireworm
- Hope to continue into long term.



Soil Microbial Communities

- Research with Dr. Svetlana Yurgel, Dalhousie AC



Goals

- Evaluate a link between potato yield and disease occurrence and the diversity and structure of soil microbial communities
 - Analysis of
 - 4 fields with history of good potato yield
 - 4 fields with history of bad potato yield
 - Analysis of soil chemical prosperities
 - Analysis of soil microbial communities
 - 16 rRNA sequencing
- Identification of correlations between these parameters

Soil properties in potato fields with bad and good productivity

- Soil chemical characteristics

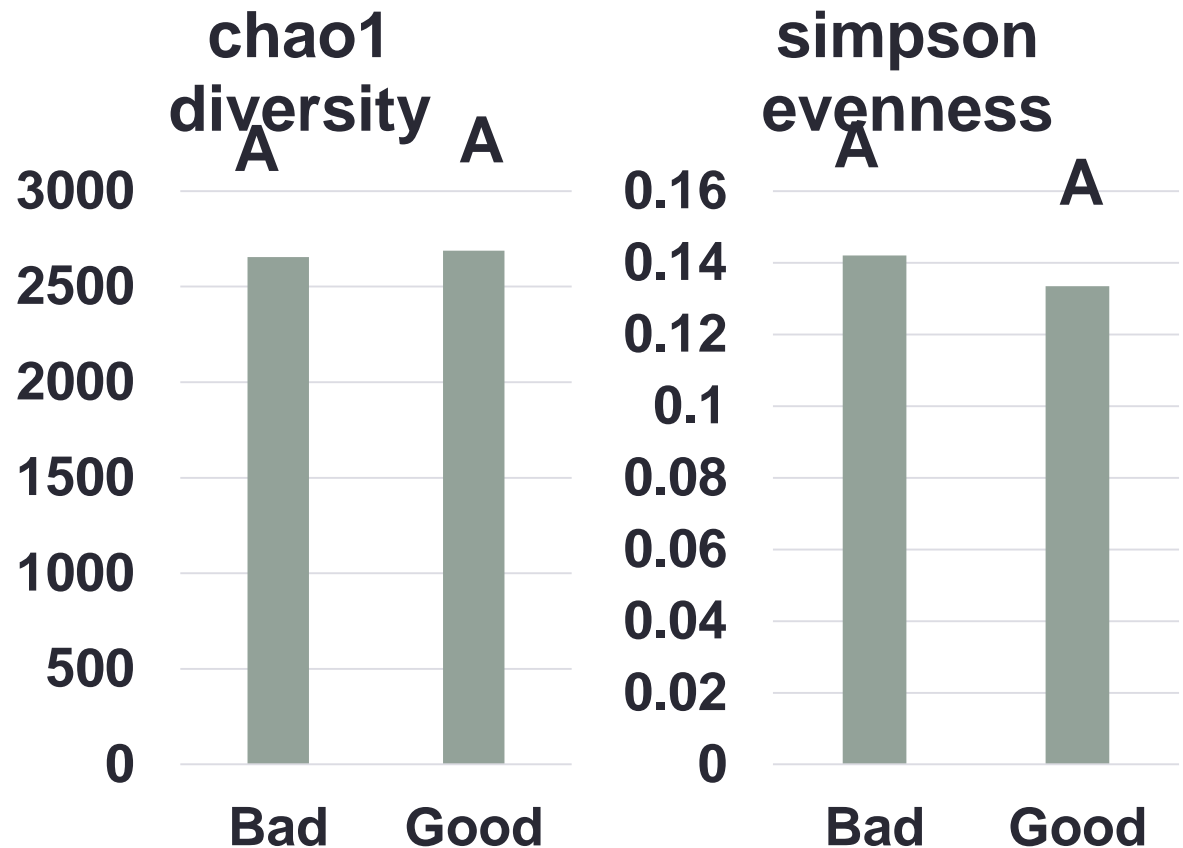
testes:

- Nitrogen (%)
 - pH (pH Units)
 - **Buffer pH (pH Units)***
 - Organic Matter (%)
 - **P2O5 (kg/ha)**
 - K2O (kg/ha)
 - Calcium (kg/ha)
 - Magnesium (kg/ha)
 - Sodium (kg/ha)
 - **Sulfur (kg/ha)**
 - **Aluminum (ppm)**
 - Boron (ppm)
 - **Copper (ppm)**
 - **Iron (ppm)**
 - **Manganese (ppm)**
 - **Zinc (ppm)**
 - CEC (meq/100 g)
- There are some significant differences in soil chemical characteristics that can be linked to fields production.
 - Interestingly there are no differences in nitrogen and organic matter contents between high and low production fields.

*In **Bold** parameters that differ between high and low productions fields

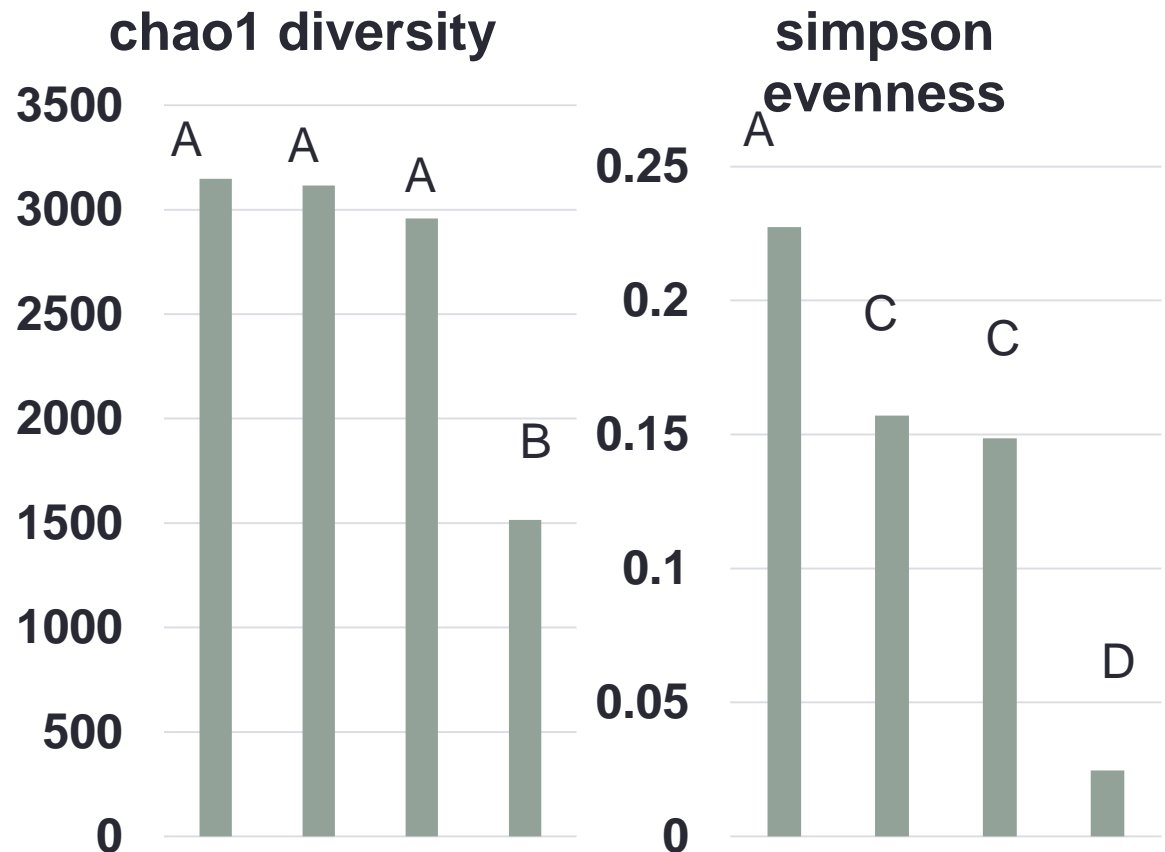
Microbial biodiversity in potato fields with bad and good productivity

- Microbial communities from the field with good and bad productivities did not differ in their biodiversity



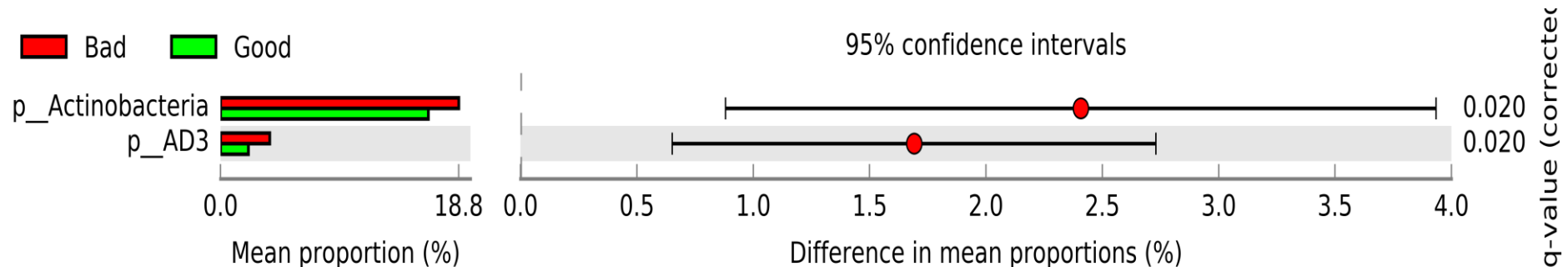
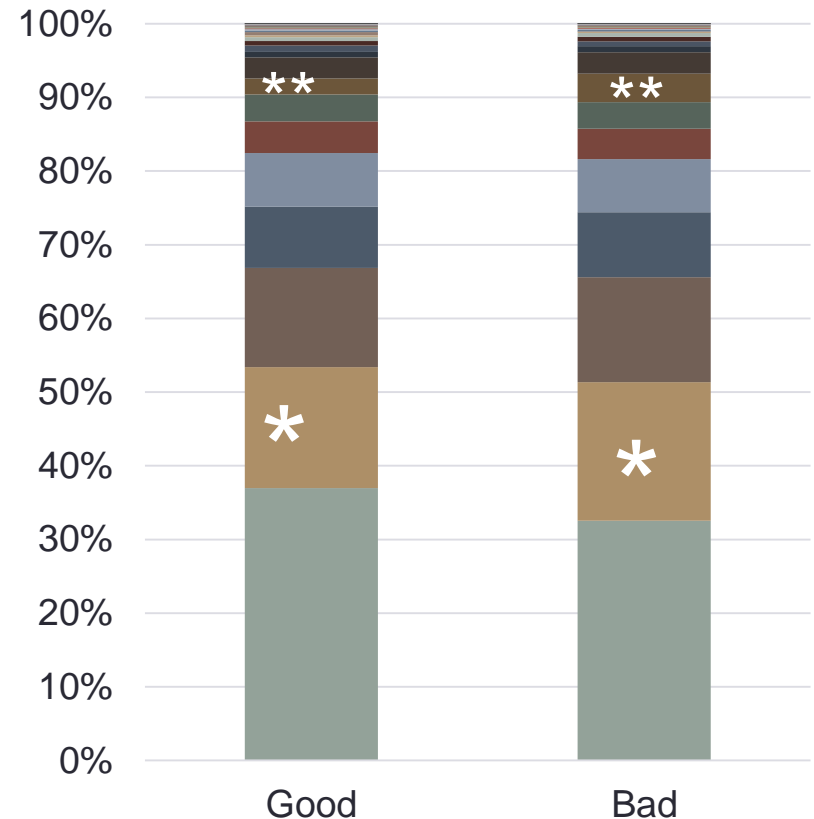
Microbial biodiversity in the fields from different producers

- Microbial communities in the field from different producers differed in their biodiversity
- Significant decrease in diversity in one producer's fields.
- What were the differences in management?
- Not obviously linked to rotation scheme



Looking for microbial groups linked to field production

- *, ** Bacterial groups with relative abundances different between fields with low and high potato yield



Conclusions and future directions

- Soil chemical composition can be linked to field production
 - What are the differences in land-management between the fields?
 - How microbial taxa are affected by soil chemical properties?
 - Limited number of fields are analyzed
- Land-use can have a significant effect on soils biodiversity
 - What are the factors?
 - Land-management scheme analysis
 - How biodiversity is linked to soils disease suppression? Is it “good” or “bad”?
 - Link between crop yield and disease detection with metagenome data
 - Extensive fields surveys

Early Dying Survey - 2017

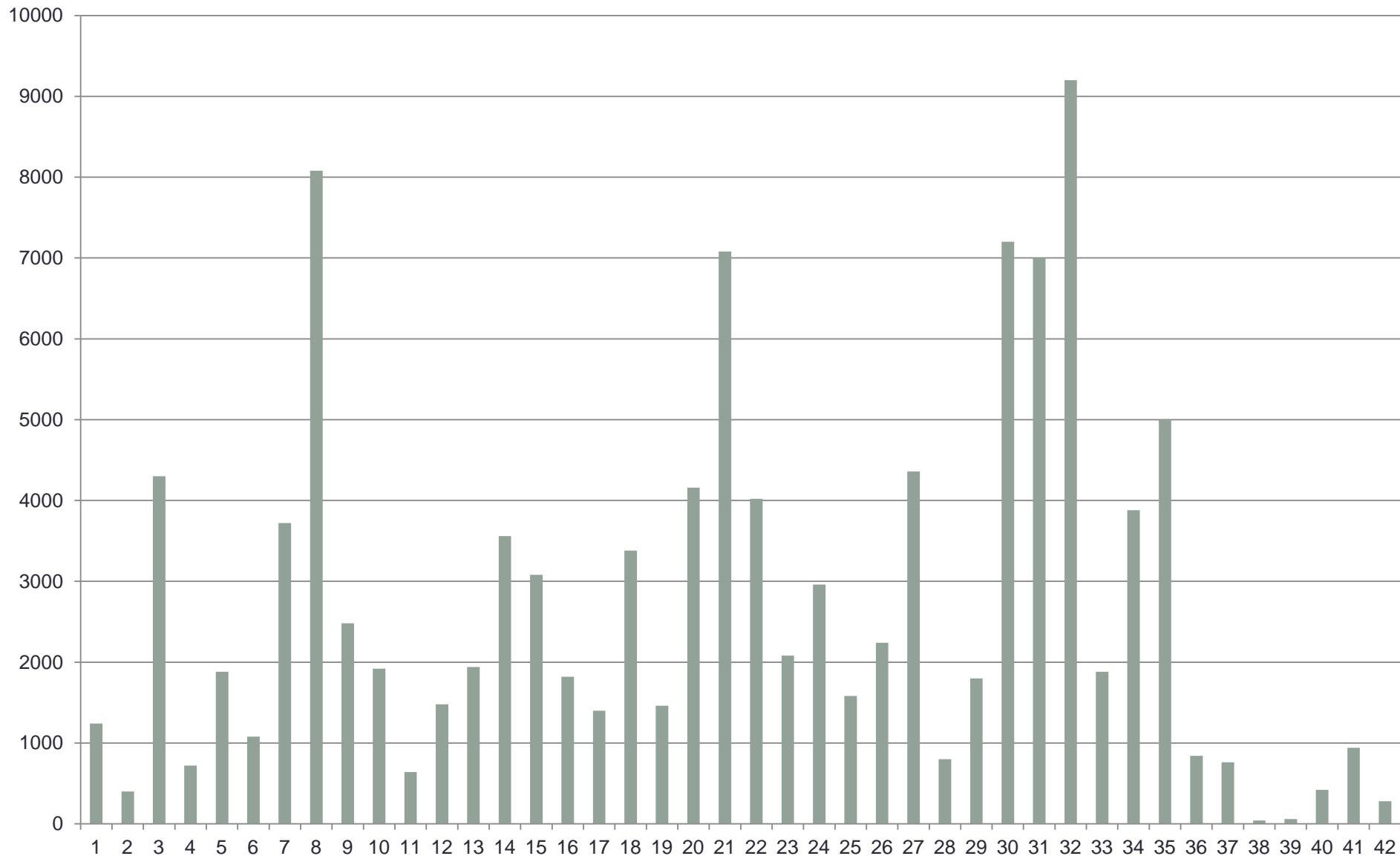
- Working with AAFC to assess level of Verticillium and root lesion nematodes in PEI fields
- Tested fields in some rotation crop in 2017, targeted for potatoes in 2018.
- Tried to capture wide range of crops, fields all over the province.
- Some fields had a split of two different rotation crops
- Tested 3 fields with potatoes in 2017 that had a split in rotation crop in 2016



Root Lesion Nematodes – Fall 2017

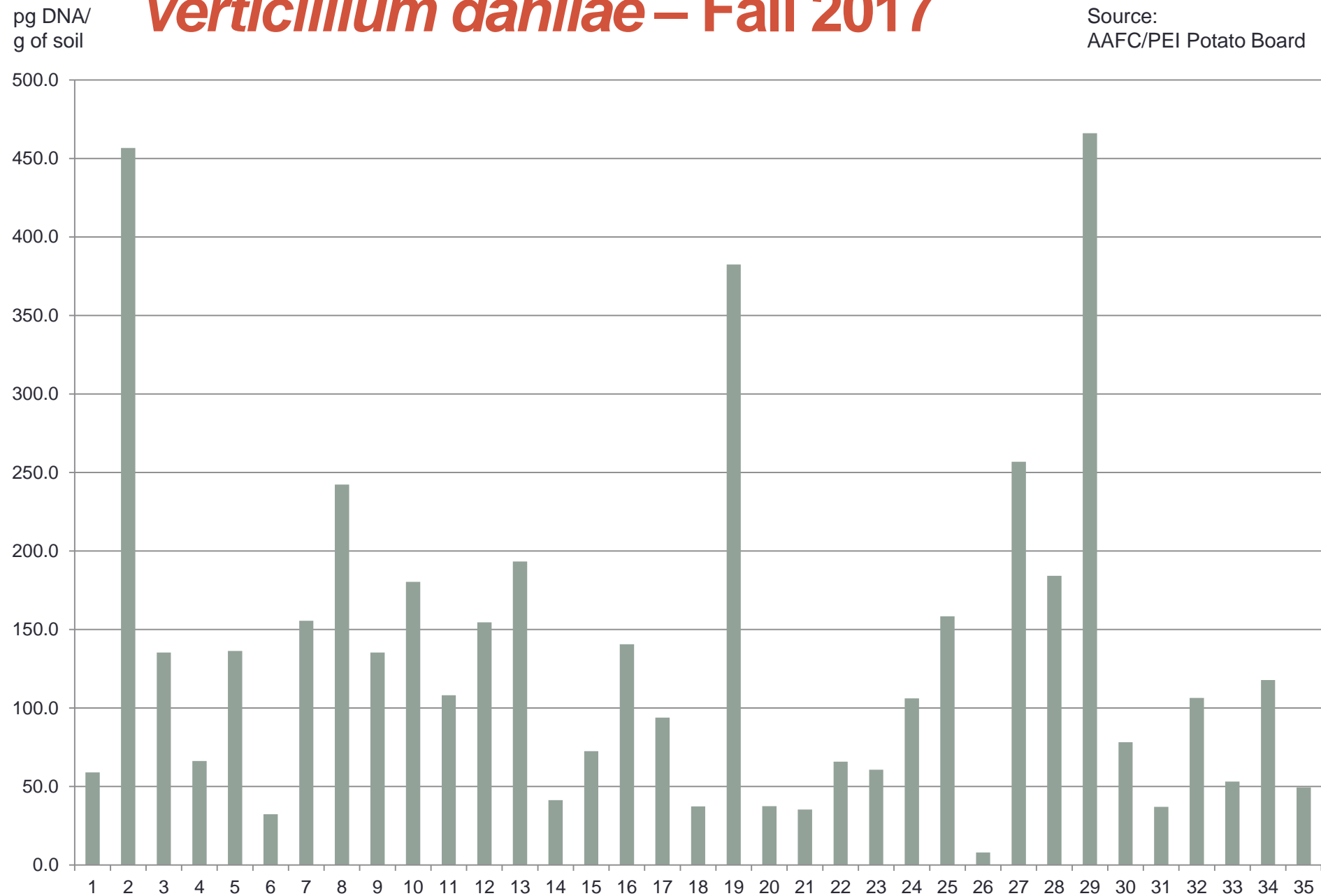
Source:
AAFC/PEI Potato Board

#/kg soil

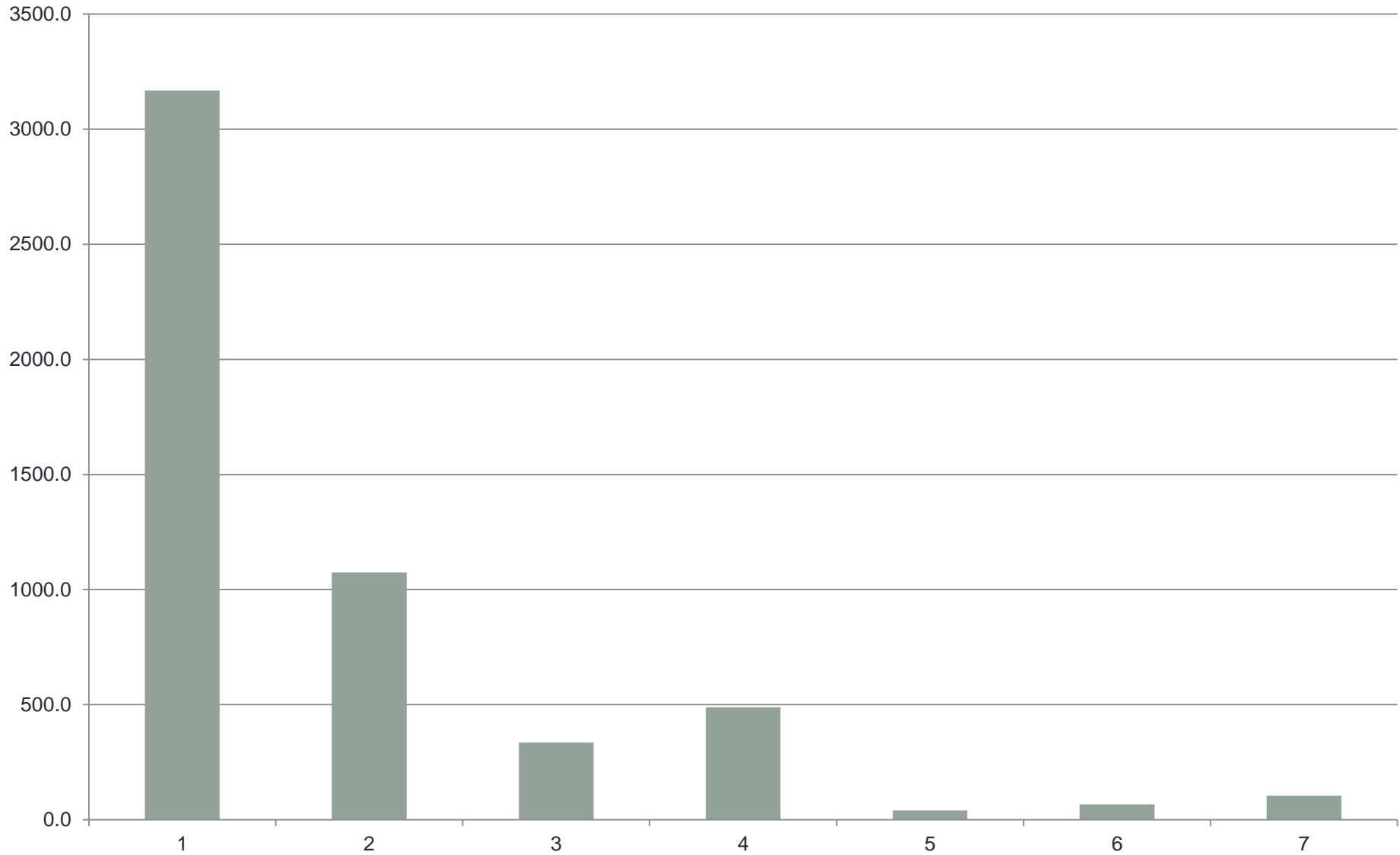


Verticillium dahliae – Fall 2017

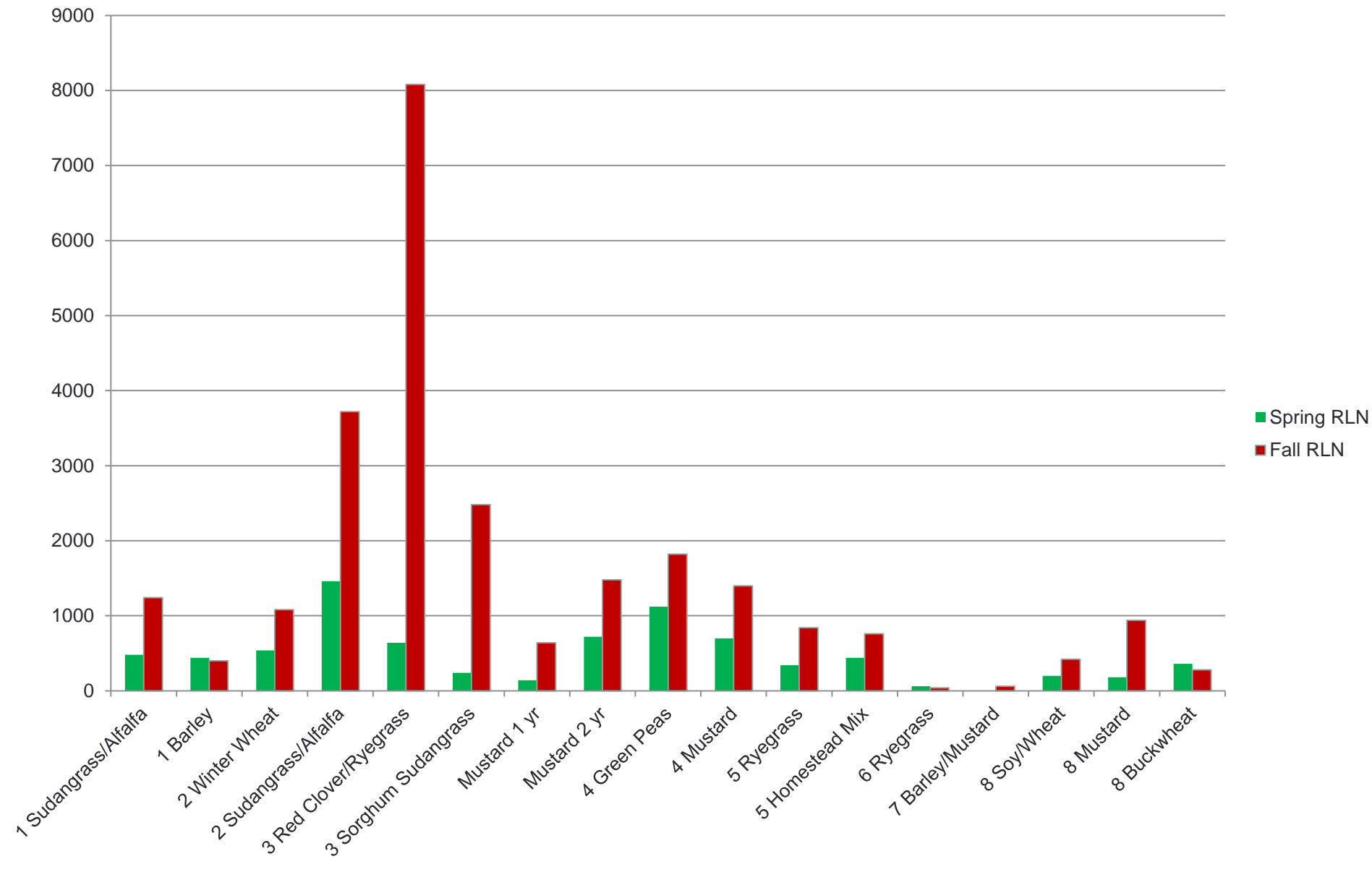
Source:
AAFC/PEI Potato Board



Verticillium dahliae after potatoes – Fall 2017

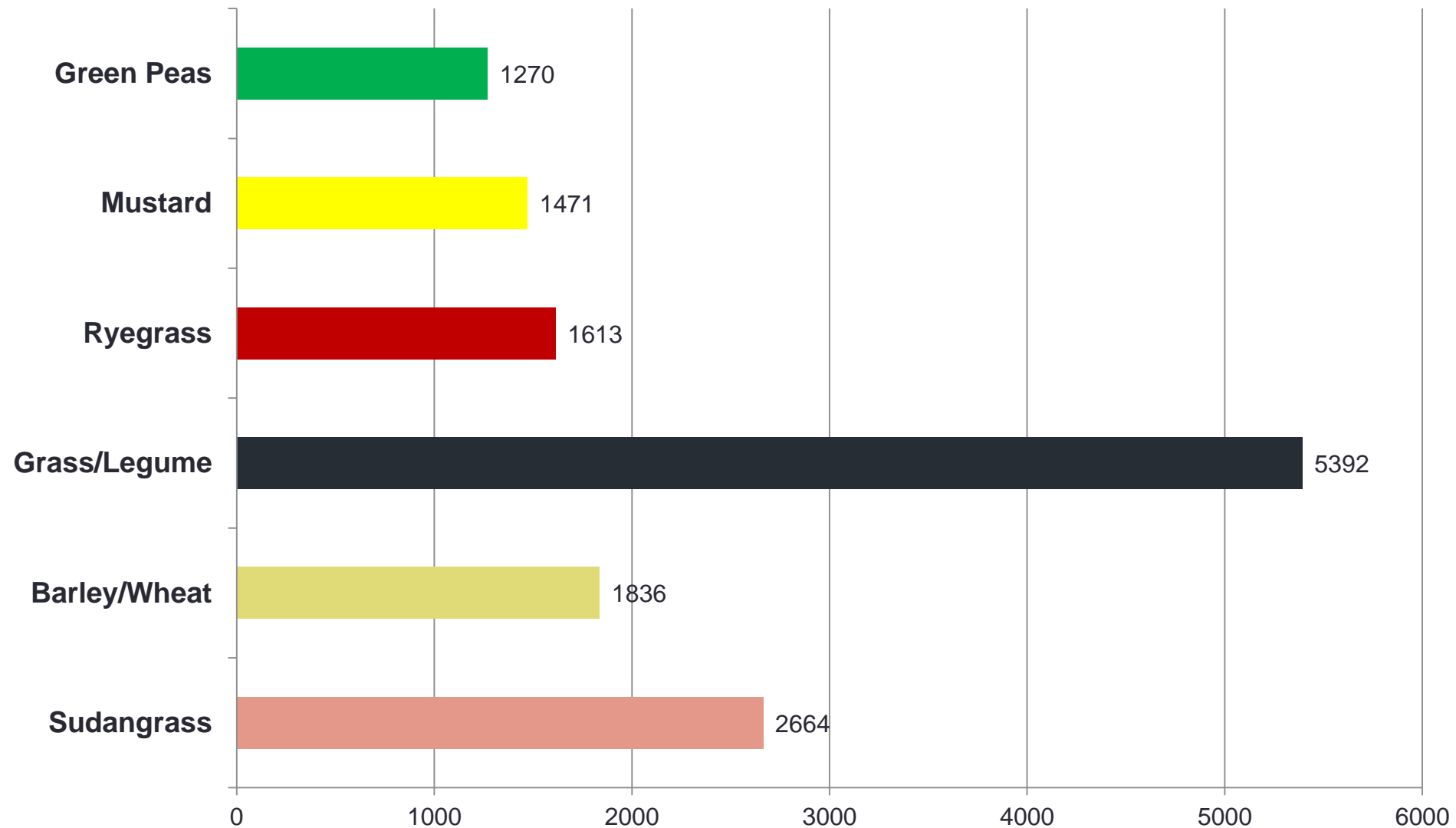


Early Dying Survey - 2017



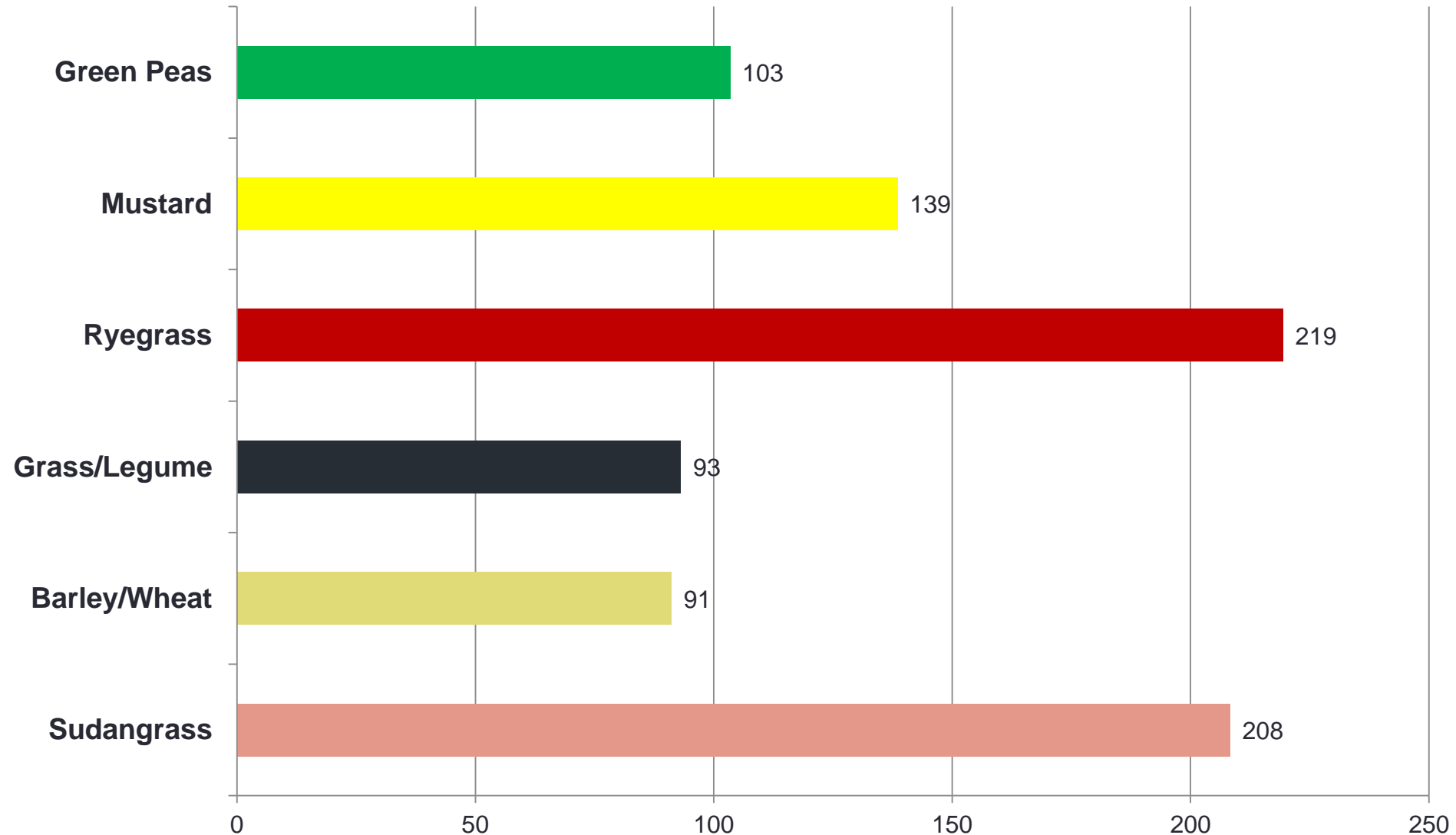
Early Dying Survey - 2017

Fall Root Lesion Nematodes (#/kg of soil)



Early Dying Survey - 2017

V. dahliae (pg DNA/g of soil)



Early Dying Survey - 2017

Frito-Lay variety

	Ryegrass	Homestead Mix
Total Yield (cwt/ac)	233	223
Spec. Gravity	1.090	1.087
Wireworm Incidence	3.2/10	2.0/10
Holes/Tuber	7.0	3.3



Early Dying Survey - 2017

Russet Burbank

	Soy/WW	BW/BW	Mus/Mus
Total Yield (cwt/ac)	354	420	470
Marketable Yield (cwt/ac)	274	340	405
Spec. Gravity	1.087	1.087	1.085
Wireworm Incidence	4.5/10	1.5/10	1.8/10
Holes/Tuber	2.0	0.3	0.3



Ethylene Trial

- Ethylene gas has been proven to act as a sprout inhibitor at certain concentrations in storage. Alternative to CIPC in Europe.
- Also has been shown at higher concentrations to help break apical dominance in seed and promote accelerated and even emergence and increased stems/tubers per plant.
- Visited with representatives of Restrain Company and growers using the product in the NL & UK



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- Visited with representatives of Restrain Company and growers using the product in the NL & UK



Ethylene Treatment

- Experience in Western Europe is that 90-120d of exposure to ethylene results in faster emergence, more stems per plant and more tubers per stem, especially for varieties with low stem/tuber numbers (ie. Shepody)
- Used along with tighter spacing, fertility to produce seed lots of consistent size and shape



Ethylene Treatment

- 2018 Plot Trial with AAFC
 - Comparing ethylene treatment versus non-treated
 - 5 processing varieties, 3 table varieties for comparison
 - Two plot sites
- Working with colleagues in other provinces as well as Restrain to accelerate approval by PMRA for seed piece treatment in Canada, both as sprout inhibitor and growth promoter.



Ethylene Treatment



Study Tour of NL & UK

- November 2017 with members of Seed WG
- 3 days in NL
 - 4 seed growers
 - Agrico & HZPC
 - Seed grading & distribution facility
 - Tolsma
- 5 days in England/Scotland
 - British Potato Show in Yorkshire
 - Processing farm in Yorkshire
 - Greenvale/Restrain Company in Scotland
 - High gen seed farm in Scotland



Study Tour of NL & UK



Study Tour of NL & UK



Study Tour of NL & UK



Study Tour of NL & UK

- Planting whole seed is the norm, sized and marketed/planted by size for ideal plant pop'ns
- A lot of concern about blackleg, other diseases, PCN
- Seed is handled a bit more than here, exclusively in boxes
- Average seed size would be much larger than in commercial production in PEI
- Declining soil health a concern in both countries, efforts to extend rotations, especially in seed production
- Facilities to handle seed (diff varieties, diff sizes, diff treatments) more flexible.



Study Tour of NL & UK

- What can we do here?
 - Sizing seed
 - Trying to reduce oversize in seed lots
 - Single cutting of seed 5 to 7 oz?
 - Ethylene seed treatment?
 - Focus on even emergence with effective plant populations
 - Investigate improvements to seed handling/storage



Future Projects for Grower Participation



Future Projects for Grower Participation

Effect of Seed Piece Size

- Demo plots explore the adverse effects of small seed piece size.
- Ask participating growers to hand-plant a few plots of seed of different sizes
 - Regular run of cut seed that would be normal to farm.
 - Regular run of cut seed with slivers/small pieces under 2 oz. removed
 - Row of just the slivers/small pieces under 2 oz.
 - Row of whole tubers between 2 and 3 oz (similar in size to average cut seed)
- Offer assistance in set up of plots in the spring and evaluation of plots in fall.
- Grower can do as many plots as they wish, multiple varieties.
- Collect photos/data from plots in the fall for extension purposes.



Future Projects for Grower Participation

Fall Hilling Trial

- To assess the value of forming hills in the fall with a cover crop on marketable yield
- Hills made/cover crop planted no later than Sept 20
- Hilling done with normal row shaper. Spin on seed after hilling (barley or oats)
- “Freshen” the hills in the spring immediately ahead of potato planting.
- Subset of fields will have temp/moisture monitors in 2019
- Fields in Maine saw over 40 cwt/ac improvement where hills were made without use of fumigant



Future Projects for Grower Participation



Future Projects for Grower Participation



Future Projects for Grower Participation

Early Dying Complex

- Cavendish will be looking for participating growers for field scale evaluation of Aprovia and Velum Prime
- Continued work on Vert/Nematode survey
- Field scale evaluation of effect of different rotation crops
 - Brown Mustard
 - Sorghum Sudangrass
 - Forage Pearl Millet
- If individual growers want to do a crop evaluation on their own....be sure to leave a check strip!



#SoilYourUndies

Do your own fun soil science experiment to see how healthy your soil is and share your experiences @SoilCouncil.

Anyone can investigate biological activity in farm fields or backyard gardens. Bury a pair of 100 per cent white cotton underwear in topsoil for about two months and then check the level of decomposition. If there's not much left of the underwear you have good biological activity, which indicates healthy soil. These same soil organisms can break down plant materials in much the same way.

To make a good on-farm comparison:

- Test similar soil types under different rotations and tillage management
- Keep track of each pair by writing an identifying number on the waistband
- Be sure to bury all underwear being compared on the same day and for the same amount of time



WHAT YOU'LL NEED

- New pair of white 100% cotton briefs (no dyes or polyester blends)
 - Shovel
 - Marker flag
- 1) Dig a narrow trench and bury the underwear in the top six inches of soil
 - 2) Leave the waistband showing a little and mark the place with a flag so you'll be able to find it again
 - 3) Leave the underwear buried for about two months
 - 4) Dig it up carefully and wash it in a bucket of water to remove the soil

Future Projects for Grower Participation

Late Blight Forecasting/Spore Trapping

- Ukko Agro Blight Decision Support Tool
- AIR Spore Trapping



Grower Consultation

- In June 2016, we held a grower consultation meeting to determine what the priorities for research and agronomy were for processing growers. This would direct the areas of interest for the AIM working groups.



Seed Priorities – June 2016

High Priority

- Whole Seed vs Cut Seed
- Seed Treatments
- Clonal Selection for PEI conditions
- Seed Generation Effect

Medium Priority

- Comparing Fresh Cut vs Stored Cut
- Seed Fertility Mgmt (including Calcium)
- Physiological Age
- Cost/Benefit of Refrigerated Storage
- Virus/Disease Management in Seed



Seed Priorities – June 2016

High Priority

- Whole Seed vs Cut Seed (**YES**)
- Seed Treatments (**CAVENDISH**)
- Clonal Selection for PEI conditions (**NO**)
- Seed Generation Effect (**YES**)

Medium Priority

- Comparing Fresh Cut vs Stored Cut (**NO**)
- Seed Fertility Mgmt (including Calcium) (**PLANNED**)
- Physiological Age (**PLANNED**)
- Cost/Benefit of Refrigerated Storage (**NO**)
- Virus/Disease Management in Seed (**PLANNED**)



Seed Priorities – June 2016

Lower Priority

- Management Profile by Variety
- Specific Gravity of Seed
- Disinfection during cutting/handling of seed
- Best Practices for new seed growers
- Information on new/emerging diseases and pests



Soil Priorities – June 2016

High Priority

- Value of different crop rotations, including lengths/new crops
- Residue Tillage
- Balancing rotation between wireworm & soil OM
- Early Dying

Medium & Low Priority

- Erosion Control
- Cover Crops
- Rotations to Build Soil OM
- Economic Analysis for Nutrient Removal in Rotation
- Soil Compaction



Soil Priorities – June 2016

High Priority

- Value of different crop rotations, including lengths/new crops (**NO**)
- Residue Tillage (**YES**)
- Balancing rotation between wireworm & soil OM (**YES***)
- Early Dying (**YES**)

Medium & Low Priority

- Erosion Control (**NO**)
- Cover Crops (**YES, PLANNED**)
- Rotations to Build Soil OM (**YES**)
- Economic Analysis for Nutrient Removal in Rotation (**NO**)
- Soil Compaction (**YES**)



Soil Priorities – June 2016

Lower Priority

- In-Furrow Zinc and Calcium
- Increasing GPS Soil Sampling
- Fertigation
- Addressing over-tillage
- Measuring water holding capacity in soil
- Nutrient Management Practices
- Variable Rate Fertilizer/Lime
- Drainage
- Nitrate mitigation
- Fertilization by soil profile
- Soil Fumigation



Science/Tech Priorities – June 2016

High Priority

- Precision Ag and Site Specific Tech
- Basket Hillers vs Row Shaping
- Management of Seed Storages
- Analysis of Different Ventilation Systems

Medium Priority

- Planter Row Width
- Yield Monitoring
- Benchmarking with Grower Data
- New Tech/Equipment for Fertility



Science/Tech Priorities – June 2016

High Priority

- Precision Ag and Site Specific Tech (**YES**)
- Basket Hillers vs Row Shaping (**YES**)
- Management of Seed Storages (**NO**)
- Analysis of Different Ventilation Systems (**PREVIOUSLY**)

Medium Priority

- Planter Row Width (**NO**)
- Yield Monitoring (**YES**)
- Benchmarking with Grower Data (**YES**)
- New Tech/Equipment for Fertility (**NO**)



Sci/Tech Priorities – June 2016

Lower Priority

- **New Varieties**
- Plant Health – Fungicide Programs
- Dammer-Diker – Cost/Benefit
- Mycorrhizal Products
- Improving planter speed while maintaining accuracy
- Innate varieties
- **Set Cutter Calibration**
- Mechanical Damage/Bruising Measurement
- Tramlines for Spraying
- Drone Technology



Thank You!

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Agri-Food Canada