British Columbia Living Lab Field Vegetable Sector

Year 1 report to:
The BC Potato & Vegetable Growers' Association

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Executive Summary

Part of the national Agricultural Climate Solutions – Living Labs program, the BC Living Lab collaborates with local producers to improve farming practices, reduce greenhouse gas emissions, and sequester soil carbon through the implementation of several priority beneficial management practices (BMPs). The objectives are to increase adoption of tested BMPs, understand barriers to adoption, and quantify the climate mitigation effects. Three BMPs were tested this year in field vegetables and a brief outline of their methods is as follows:

1. Compost application in potatoes.
    a. In four fields, compost was applied to a 5 acre area of the field and compared to a standard grower practice in the rest of the field.
2. Split nitrogen application in potatoes.
    a. In one field, nitrogen application was split with 50% applied at planting and 50% applied at hilling on 10 acres, compared to a standard practice of applying all required nitrogen at planting.
3. Winter cover cropping in peas.
    a. In three fields, a winter cover crop was planted with 2-2.5 acres of the field left fallow for comparison.

The data collected were soil samples for all three trials, petiole samples, yield assessments for compost and split nitrogen trials, and ground cover assessments for the cover crop trial.

A general trend showed that potato yield tended to be higher in the areas where compost was applied compared to the standard practice. Three of the four fields saw an increase in extrapolated total yield ranging from 1.04 to 3.13 tons/ac. When results were combined over the four fields, 70% of petiole samples indicated a higher level of potassium (K) in the compost area compared to the standard practice area. Soil organic matter increased more through the season in the compost treatment compared to the standard practice for all fields, however additional years of data collection are required to confirm those trends.

Potato yield was higher in the split nitrogen area than the standard practice area. The mean yield extrapolated to tons/ac was 25.49 in the split nitrogen area compared to 22.43 tons/ac in the standard practice area. Petiole nitrate levels were slightly higher in the split nitrogen area than the standard practice area for most of the sampling period.

Cover cropping provided high ground cover (up to 100%) compared to areas left fallow, and nitrate was lower in areas that were cover cropped, with a decrease in nitrate of 60, 59, and 22 kg/ha in fields V6, V7, and V8 respectively.

Field-specific results were shared with the participating growers to provide an overview and assist with their management decisions. Future years of this study could look at refining petiole and soil sampling methodology and increasing grower and field participation.

Introduction

Part of the national Agricultural Climate Solutions – Living Labs program, the BC Living Lab brings together farmers, scientists and other partners in the province to co-develop and test agricultural innovations. By collaborating with local producers, the living lab is working to to improve farming practices, reduce greenhouse gas emissions, and sequester soil carbon through the development and implementation of several priority beneficial management practices (BMPs).

Field vegetables are an important cash crop in the Lower Mainland of British Columbia. Local growers have indicated several priority beneficial management practices (BMPs) to improve practices as well as reduce greenhouse gas emissions and sequester soil carbon. Incorporation of these BMPs may help growers improve profits, improve long-term sustainability of the agricultural land, as well as meet their legal requirements for the Code of Practice for Agricultural Environmental Management (AEM Code). This sector of the living lab will implement these BMPs in collaboration with participating growers over the course of five years. The following BMPs were studied in three trials within this report:

1. Compost application in potatoes.
2. Split nitrogen application in potatoes.
3. Winter cover cropping in peas.

Compost application and split nitrogen application are included as part of the '4Rs of nutrient management' BMP. It states the importance of using the right source, right rate, right time, and right place to apply nutrients. Compost adds carbon inputs to maintain soil health and splitting nitrogen applications provide the crop with fertilizer when it is most effectively taken up. These provide the environmental benefit of reducing nitrous oxide emissions and increasing carbon sequestration. Grower benefits of 4R nutrient management are two-fold; (1) profit increases with targeted fertilizer application reducing the need for fertilizer and (2) increasing soil organic matter (SOM) to improve soil health, nutrient cycling, and water holding capacity.

Winter cover crops are planted after cash crop harvest and are cultivated into the soil in the late fall or spring before planting of the subsequent cash crop. Environmental benefits of this BMP include providing soil cover to prevent erosion, SOM increases, improving nutrient cycling, and, in the case of planting legumes, fixing of atmospheric nitrogen. Growers benefit from each of these outcomes as well as the added in-season benefits that a cover crop provides, such as weed suppression and reduced fertilizer application requirements.

The overall objectives of the living lab are to increase adoption of tested BMPs, understand barriers to adoption, and quantify the climate mitigation effects.

Methods

In 2023, the project consisted of three field trials to test the best management practices of (1) compost application, (2) split nitrogen, and (3) cover cropping after cash crop harvest (Fig. 1).

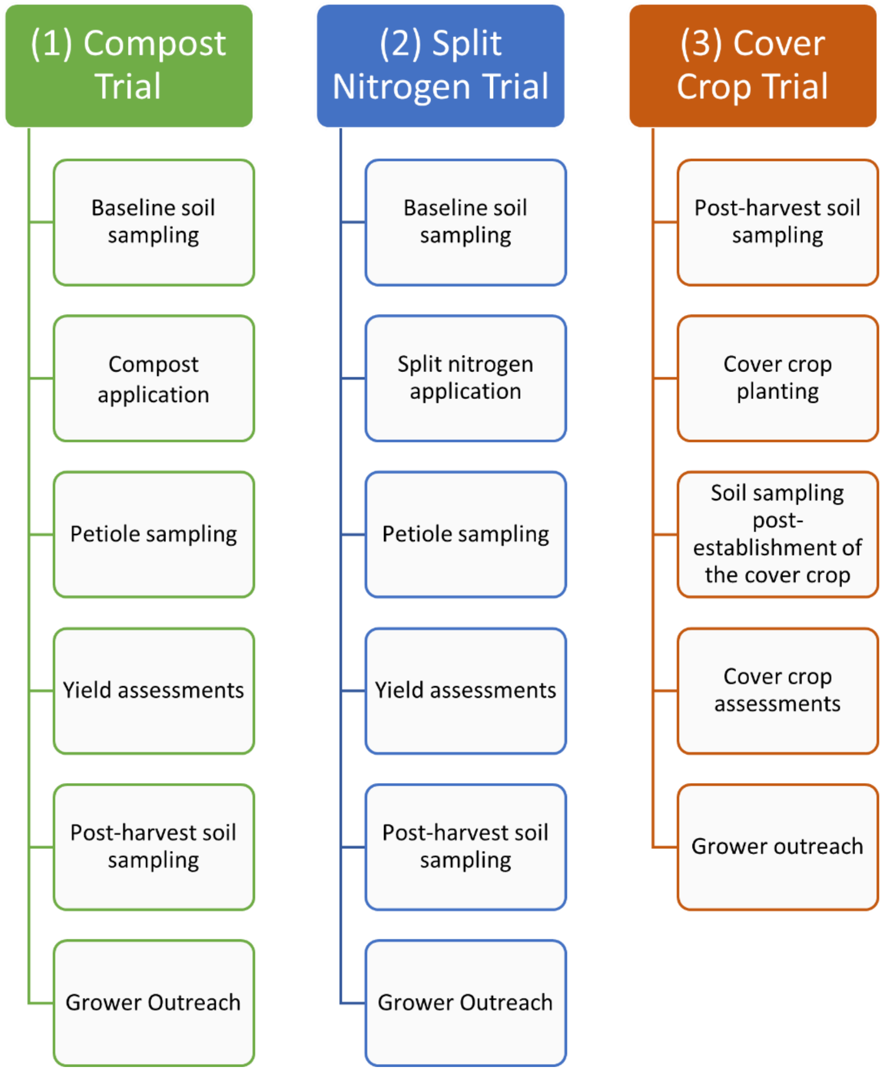

Figure 1. Flow chart outlining sequence of events for each of the three field trials in the 2023 BC Vegetable Living Lab.

(1) Compost trial

<u>Compost application</u>

There were four fields (V1-V4) included in this trial. Compost was purchased from Davison Farm in Maple Ridge, British Columbia (BC) and was 100% cattle manure. Compost delivery for field V1 was delivered on March 4 and spread by the grower on March 6, 2023, while compost delivery for fields V2, V3, and V4 was delivered on May 2 and spread on May 4, 2023 (Table 1). The rate of compost application was 100 cubic yards spread over five acres of the field, with the specific location designated by the grower.

Table 1. Details for the four fields as part of the compost trial in the 2023 project, including field location within British Columbia's Fraser Valley, crop grown, and dates for compost delivery and spreading, and baseline and post-harvest soil sampling.

Field ID	Location	2023 crop	Compost delivery date	Compost spreading date	Baseline soil sampling date	Post-harvest soil sampling date
V1	Surrey	Potatoes	March 4	March 6	March 6	July 20
V2	Delta	Potatoes	May 2	May 4	March 22	September 1
V3	Delta	Potatoes	May 2	May 4	March 22	October 13
V4	Delta	Potatoes	May 2	May 4	March 29	September 22

<u>Baseline soil sampling</u>

Baseline soil samples were collected at the four field sites. Sampling was performed between March 6 and March 29, 2023 by Dave Melnychuk, P.Ag., private consultant. In the treatment area (i.e. compost applied), soil was collected from five random locations at each of the following depths: 0-15 cm, 15-30 cm, and 30-60 cm. Two random locations within the standard practice area (i.e. no compost was applied) were sampled for the same depths. The GPS coordinates were recorded for all areas.

Per soil sample, a hole was dug to approximately 60 cm or until clay or water was reached. Soil probes were used to collect 5-7 cores surrounding the hole for samples collected at 0-15 cm and 15-30 cm, until approximately two cups of soil were collected. A shovel was used to collect the same volume from 30-60 cm depth.

Samples were collected into re-sealable bags labelled with sample ID, depth, and date collected. Testing was done in two phases: a 'grower' sample from each of the compost and standard practice areas was submitted to Element Vancouver, Surrey, BC, within 24 hours of collection; the remaining 'research' samples were initially submitted to Agriculture and Agri-food Canada (AAFC) for further research analysis but, due to time constraints, were ultimately also submitted to Element.

<u>Petiole sampling</u>

Petiole sampling occurred weekly at the four field sites starting at 30 days after emergence. Sampling continued for six weeks or until top-kill. One composite sample was collected within the compost area and one composite sample within the standard practice area. One sample consisted of 30+ petioles collected randomly throughout each treatment, following a zig-zag pattern to ensure good coverage. Per petiole, the fourth compound leaf from the top was collected, leaflets were removed, and any dirty samples cleaned with deionized water and patted dry.

Petioles were placed into a brown paper bag labelled with sample ID, and date collected, then put in a cooler. Samples were shipped to A&L Canada Laboratories Inc., London, Ontario, within 24 hours via Terralink or Purolator.

Yield assessments

Yield assessments were done as close to harvest as possible. Three fields were harvested after top-kill, while one was harvested with vines intact. Four subplots were harvested within each of the compost and standard practice areas for a total of eight subplots per field site. One subplot consisted of one row of potato plants measuring 7'3". Plants within each subplot were counted, hand harvested, and tubers were sorted into small (<2" diameter), medium (2-3.5" diameter) and large (>3.5" diameter) size categories. Tubers in each category were then counted and weighed. Subplots were randomized throughout the field and tractor rows were avoided. At each subplot, tubers were collected from one additional plant to submit to AAFC for additional analyses.

Post-harvest soil sampling

Post-harvest soil samples were collected by Dave Melnychuk at the same GPS coordinates that were recorded during baseline soil sampling. In the compost area, soil was collected from five locations at 0-30 cm depth and two locations at 0-30 cm depth within the standard practice area.

Both grower and research samples were collected between July 20 and October 13, 2023, depending on when the fields were harvested (Table 1). Samples were collected, labelled, and stored following the same protocol as baseline soil sampling and delivered to Element within 24 hours of collection.

(2) Split nitrogen trial

There was one field (V5) included in this trial (Table 2).

Table 2. Details for the one field as part of the split nitrogen trial in the 2023 project, including field location within British Columbia's Fraser Valley, crop grown, and dates for nitrogen applications, and baseline and post-harvest soil sampling.

Field ID	Location	2023 crop	First nitrogen application	Second nitrogen application	Baseline soil sampling date	Post-harvest soil sampling date
V5	Delta	Potatoes	May 17	June 20	April 27	October 2

Baseline soil sampling

Baseline soil samples were collected by E.S. Cropconsult Ltd.

One composite 'grower' soil sample was collected in each of the treatment (i.e. split nitrogen) and standard practice (i.e. all nitrogen applied at planting) areas for the following depths: 0-15 cm and 15-30 cm. Each grower sample contained 15-30 subsamples collected by a soil probe and randomly spaced throughout the split nitrogen and standard practice areas. Any organic matter was brushed to the side to ensure only soil was sampled. Grower samples collected into re-sealable bags labelled with sample ID, depth collected, and date collected, then placed in a cooler and delivered to Element that same day.

'Research' samples for AAFC were collected differently from the grower samples. Four random locations in each of the split nitrogen and standard practice areas were sampled at the following depths: 0-15 cm and 15-30 cm. Per location, GPS coordinates were recorded and soil probes were used to collect 5-7 cores at 0-15 cm and 15-30 cm depth, until approximately two cups of soil were collected. Samples were collected into re-sealable bags labelled with sample ID, depth collected, and date collected. Due to strike action, these samples were unable to be delivered to AAFC until May 4, 2023 and were stored in the fridge prior to delivery. Due to time constraints, those samples were ultimately also submitted to Element.

Split nitrogen application

All fertilizer was applied by the grower. In the split nitrogen area, half the nitrogen was applied at planting along with all other nutrients (5-9-24; 1.4 Ca, 2 Mg, 8 S, 0.2 Mn, 0.2 B at 1000 lb/ac) (Table 2). The remaining half of the nitrogen was applied at hilling via side-dressing in the form of Urea (46-0-0 at 110 lb/ac). In the standard practice area, all nitrogen was applied up front at planting with the same blend of other nutrients (10-9-24; 1.4 Ca, 2 Mg, 8 S, 0.2 Mn, 0.2 B at 1000 lb/ac).

Petiole sampling

Petiole sampling occurred weekly starting at 30 days after emergence. Weekly sampling occurred for six weeks, missing one week (July 31, 2023) due a chemical spray preventing entry to the field. One composite sample was collected within the split nitrogen area and one composite sample within the standard practice area. One sample consisted of 30+ petioles collected randomly throughout each treatment, following a zig-zag pattern to ensure good coverage. Per petiole, the fourth compound leaf from the top was collected, leaflets were removed, and any dirty samples cleaned with deionized water and patted dry.

Petioles were placed into a brown paper bag labelled with sample ID and date collected, then put in a cooler. Samples were shipped to A&L Canada Laboratories within 24 hours via Terralink or Purolator.

Yield assessments

Yield assessments were done at the site after top-kill and as close to harvest as possible. Four subplots were assessed within each of the split nitrogen and standard practice areas for eight subplots at each site. One subplot consisted of one row of potato plants measuring 7'3". Plants within each subplot were counted, hand harvested, and tubers were sorted into small, medium, and large, before weighing by size profile. Subplots were assessed within several feet of the GPS coordinates collected at baseline soil sampling and tractor rows were avoided. At each subplot, tubers were collected from one plant to submit to AAFC for additional analyses.

Post-harvest soil sampling

Post-harvest soil sampling took place at the same field site and within several feet of the GPS coordinates taken at baseline soil sampling. Sampling was performed on October 2, 2023 by E.S. Cropconsult Ltd. (Table 2). The same methods as baseline soil sampling were followed. Grower soil samples were delivered to Element within 24 hours of collection, and research samples were stored in the fridge and delivered to AAFC on October 4, 2023. Due to time constraints, those samples were ultimately also submitted to Element.

(3) Cover crop trial

Three fields (V6-8) were chosen as trial sites (Table 3).

Table 3. Details for the three fields as part of the cover crop trial in the 2023 project, including field location within British Columbia's Fraser Valley, crop grown, and dates for harvest of main crop and cover crop planting, and baseline and post-harvest soil sampling.

Field ID	Location	2023 crop	Harvest date	Cover crop planting date	Soil sampling date prior to cover crop planting	Soil sampling date post-establishment of the cover crop
V6	Delta	Peas	July 23	August 15	August 4	October 6
V7	Delta	Peas	July 24-27	August 15	August 4	October 6
V8	Delta	Peas	July 17 & 28	August 14	August 7	October 6

Soil sampling prior to planting of cover crop (baseline)

Post-harvest of peas (before cover crop was planted) soil samples were collected by E.S. Cropconsult Ltd. Per field, one composite soil sample was collected in each of the treatment (i.e. cover crop) and fallow (i.e. no cover crop) areas for the following depths: 0-15 cm and 15-30 cm.

One composite 'grower' soil sample was collected in each of the cover crop and fallow areas for the following depths: 0-15 cm and 15-30 cm. Each grower sample contained 15-30 subsamples collected by a soil probe and randomly spaced throughout the cover crop and fallow areas. Any present organic matter was brushed to the side to ensure only soil was sampled. Grower samples collected into re-sealable bags labelled with sample ID, depth collected, and date collected, then placed in a cooler and delivered to Element on August 9, 2023.

'Research' samples for AAFC were collected differently from the grower samples. Four random locations in each of the cover crop and fallow areas were sampled at the following depths: 0-15 cm and 15-30 cm. Per location, GPS coordinates were recorded and soil probes were used to collect 5-7 cores at 0-15 cm and 15-30 cm depth, until approximately two cups of soil were collected. Samples were collected into re-sealable bags labelled with sample ID, depth collected, and date collected. These samples were delivered to AAFC on August 8, 2023. Due to time constraints, those samples were ultimately also submitted to Element.

Cover crop planting

The cover crop was planted by the grower with 2-2.5 acres per field left fallow as the untreated control. The cover crop mixture consisted of:

- Lavina spring forage barley
- Phacelia
- Faba bean (including petite faba bean)
- Black oil sunflower
- Smart radish
- Turnip (purple top and vivant)
- Clover (red and berseem)
- Winter lentil
- Desi chickpea
- Forage sorghum

Soil sampling post-establishment of the cover crop

Soil sampling following establishment of the cover crop took place at the same three field sites and within several feet of the GPS coordinates taken at post-harvest soil sampling. Sampling was performed by E.S. Cropconsult Ltd. after the cover crop had time to establish (Table 3). This was done to see how much nitrogen was taken up by the cover crop in the cover cropped area compared to the fallow area. The same methods as baseline soil sampling were followed. Grower soil samples were delivered to Element same-day and research soil samples were stored in the fridge and delivered to AAFC on October 12, 2023. Due to time constraints, those samples were ultimately also submitted to Element.

Cover crop assessments

Cover crop assessments were completed at the three field sites on October 6, 2023 with eight subsamples (four per treatment area) assessed at each field. One subsample consisted of assessing plant coverage within a 15.7 cm x 30.2 cm quadrat on a scale of 0-4 where 0 = no plants, 1 = 1-25%, 2 = 26-50%, 3 = 51-75%, and 4 = 76-100% coverage. Species presence was noted within the quadrat as presence/absence and general notes on prominent species and weeds were recorded.

Grower outreach for all trials

Grower outreach for the compost trial followed two approaches. Results were communicated to the participating growers via a grower-specific trial summary. Then, nutrient management reports were provided by Dave Melnychuk and in-person meetings were held with each grower to communicate and discuss the results.

Results for the split nitrogen trial and cover crop trial were communicated to the participating growers via grower-specific trial summaries.

Preliminary Results and Discussion

(1) Compost trial

Petiole sampling

Interestingly, 70% of petiole samples taken across all four fields indicated a higher level of potassium (K) in the compost areas compared to the standard practice areas (Fig. 2). Potassium is involved in processes that promote tuber sizing, so may explain the higher yields seen in some of the fields. While potassium was not limited in the soil in any field, it is possible that the compost allows the plants to take up and use potassium more effectively. Since these are preliminary results, further research will be needed to confirm this. Across all four fields, the compost treatment did not affect the levels of other macronutrients (i.e. nitrogen, phosphorous, sulfur, magnesium, or calcium) seen in petioles. Trends in nutrients at the field level were reported to the growers to use for their on-farm management decisions.

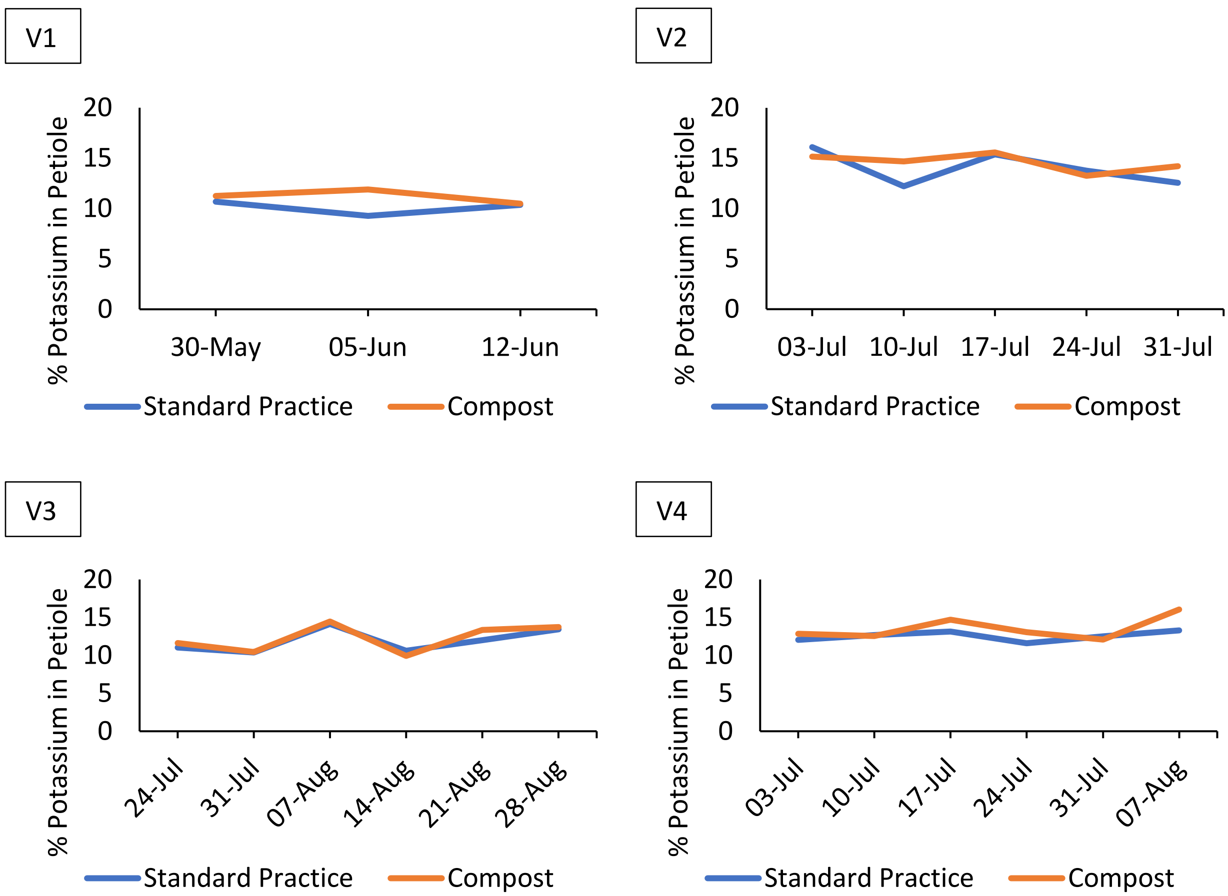

Figure 2. Petiole test results for potassium in the compost and standard practice treatments from samples collected from four compost field sites (V1-V4).

Yield assessments

In three of the four fields, yield appeared higher in the compost treatment than in the standard practice (control) area, with one field having the opposite result (Table 4). The mean yield in field V1 extrapolated to tons/ac was 15.45 in the compost area compared to 12.32 tons/ac in the standard practice area. Similarly, the mean yield in fields V2 and V3 were 25.73 and 20.50 tons/ac in the compost areas and 23.96 and 19.02 tons/ac in the standard practice areas, respectively. The yield in weight for field V4 appeared slightly higher in the standard practice area, although the compost area had more, but smaller, potatoes per plot. The mean yield extrapolated to tons/ac in V4 was 29.89 in the compost area, while the standard practice area was 31.24 tons/ac.

Table 4. Yield summary of potatoes harvested from subplots in the compost treatment and standard practice areas for four compost field sites. The average number of potatoes per plot in three size categories are shown along with the yield (tons/acre) of each size category and total yield.

		Average number of potatoes			Yield (tons/ac) in each size			Total yield (tons/ac)
Field ID	**Treatment**	**Small**	**Medium**	**Large**	**Small**	**Medium**	**Large**	
V1	Standard practice	64	33.5	0	5.53	6.80	0.00	12.32
	Compost	55.5	43.5	0.25	4.46	10.83	0.16	15.45
V2	Standard practice	9.5	55	2.5	0.96	20.89	2.11	23.96
	Compost	13.75	66	1.25	1.42	23.09	1.22	25.73
V3	Standard practice	21.75	39.5	0.75	2.39	15.90	0.73	19.02
	Compost	24.75	36	1.75	2.63	15.99	1.87	20.50
V4	Standard practice	35.5	74.25	0	3.77	27.47	0	31.24
	Compost	44.5	77.25	0	5.09	24.80	0	29.89

Since these are observational trials, and were not replicated within field, it should be repeated for multiple growing seasons to see if the result holds. It should also be noted that ideal tuber size is dependent on the variety, and the results presented are based on total yield, not allowing for culls.

Soil sampling (baseline and post-harvest)

For the compost trial, results included data collected from grower samples and research samples. Baseline soil sampling showed low levels of nitrate in all fields prior to planting. The results for post-harvest soil sampling were variable from field to field (Table 5).

Table 5. Soil organic matter (SOM) and nitrate (NO_3) for the four compost fields based on average values from samples collected from compost and standard practice areas prior to planting and post-harvest. NO_3 = Nitrate-Nitrogen; is plant available.

Field ID	**Treatment**	**Sample date**	**Sample timing**	**SOM** (%)	**NO_3** (kg/ha) 0-30cm
V1	Standard practice	March 6	Baseline	2.6	13
	Compost	March 6	Baseline	2.6	17
	Standard practice	June 19	Post-harvest	3.1	29
	Compost	June 19	Post-harvest	3.2	32
V2	Standard practice	March 22	Baseline	11.8	16
	Compost	March 22	Baseline	10.8	23
	Standard practice	September 1	Post-harvest	11.7	133
	Compost	September 1	Post-harvest	11.2	198
V3	Standard practice	March 22	Baseline	2.4	8
	Compost	March 22	Baseline	2.2	9
	Standard practice	October 13	Post-harvest	3.1	43
	Compost	October 13	Post-harvest	3.1	45
V4	Standard practice	March 28	Baseline	3.4	19
	Compost	March 28	Baseline	2.9	14
	Standard practice	September 22	Post-harvest	4.1	90
	Compost	September 22	Post-harvest	3.8	84

The compost treatment did not appear to alter levels of nitrate in fields V1, V3, and V4, while the post-harvest nitrate levels in V2 were considerably higher in the compost treatment. Soil organic matter (SOM) increased more through the season in the compost treatment compared to the standard practice for all fields (Table 5). Results this year are preliminary and require additional years of data collection to assess impact of compost on increasing SOM.

(2) Split nitrogen trial

Petiole sampling

Aside from one week near the beginning of sampling, percentages of nitrate in the petioles were slightly higher in the split nitrogen treatment compared to the standard practice area, indicating an increased nitrogen availability or nitrogen use efficiency in that treatment (Fig. 3).

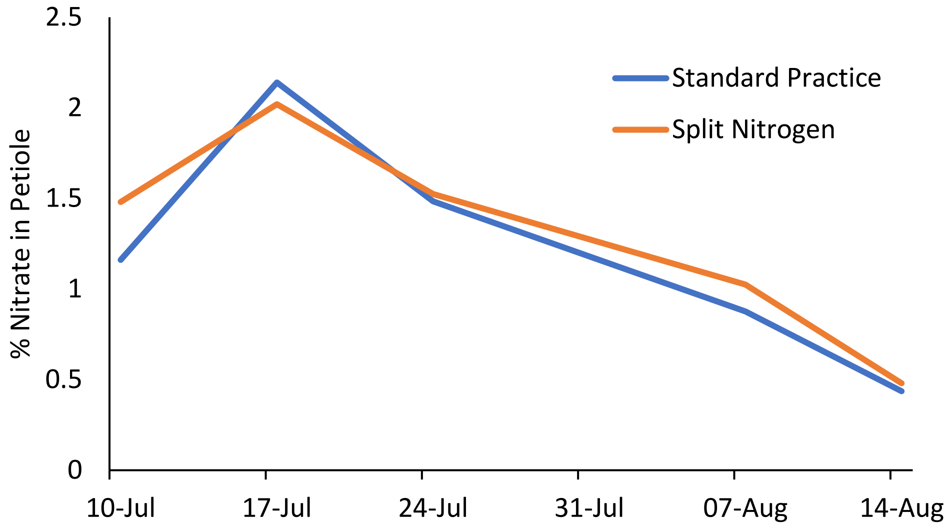

Figure 3. Nitrate levels (% nitrate) in petiole samples collected in the split nitrogen (orange line) and standard practice (blue line) areas from July 10 to August 14, 2023 in field V5. No data was collected on July 31, 2023 due to being sprayed out of the field that week.

Yield assessments

Potato tuber yield appeared higher in the split nitrogen treatment, with 25.49 tons/ac yielded from the split nitrogen area compared to 22.43 tons/ac in the standard practice area (Table 6). There were more small and medium sized potatoes in the split nitrogen area and fewer large potatoes compared to the standard practice area. Since this was an observational trial, and was not replicated, it should be repeated for multiple growing seasons to see if the result holds. These results presented are based on total yield, not allowing for culls.

Table 6. Yield summary of potatoes harvested from sub-plots in the split nitrogen treatment and standard practice areas for one split nitrogen field site.

		Average number of potatoes in each size category per plot			Yield (tons/ac) in each size category			
Field ID	**Treatment**	**Small**	**Medium**	**Large**	**Small**	**Medium**	**Large**	**Total yield (tons/ac)**
V5	Standard practice	18.25	47	1.5	2.08	19.10	1.25	22.43
	Split nitrogen	21.25	61.25	0.75	2.55	22.36	0.58	25.49

Soil sampling

Results presented here are from grower samples submitted to Element, not research samples. Baseline soil sampling showed moderate levels of nitrate in both treatment areas prior to planting. The post-harvest nitrate levels were higher in the split nitrogen treatment than the standard practice area, with 113 kg/ha remaining in the standard practice area, while 158 kg/ha was present in the split nitrogen treatment area (Table 7). This, along with the higher yield seen in the split nitrogen treatment, could indicate more efficient use of nitrogen. This BMP could allow for less nitrogen to be applied to a field if a split application is done instead of applying all nitrogen at once, where it is susceptible to leaching for a longer period of time. This is an encouraging result for this BMP because using less nitrogen fertilizer would have both an economic gain for the grower (reduced inputs) and an overall environmental gain (less nitrogen leached from the field). This work would need to be repeated to strengthen the confidence in the results.

Table 7. Nitrate (NO_3) levels from samples collected from split nitrogen and standard practice areas prior to planting and post-harvest. NO_3 = Nitrate-Nitrogen; is plant available.

Field ID	**Treatment**	**Sample date**	**Sample timing**	**NO_3** (kg/ha) 0-30cm
V5	Standard practice	April 27	Baseline	41
	Split nitrogen	April 27	Baseline	35
	Standard practice	October 2	Post-harvest	113
	Split nitrogen	October 2	Post-harvest	158

(3) Cover crop trial

<u>Soil sampling</u>

Results include data collected from grower samples submitted to Element. After the cover crop had established, nitrate levels were higher in the non-treated fallow area compared to the area planted with cover crop and this result was consistent across all three fields (Table 8). There was a decrease in nitrate levels of 60, 59, and 22 kg/ha between cover crop and fallow areas in fields V6, V7, and V8 respectively. The cover crop was very effective at taking up leftover nitrate in the soil. No differences in SOM were noted but these will likely only become apparent after the cover crop has been incorporated in the spring.

Table 8. Soil organic matter (SOM) and nitrate (NO_3) levels from samples collected from cover crop and fallow (Control) areas prior to cover crop planting and post-establishment for three cover crop trial fields. NO_3 = Nitrate-Nitrogen.

Field ID	**Treatment**	**Sample date**	**Sample timing**	**SOM** (%; 0-15cm)	**NO_3** (kg/ha) 0-30cm
V6	Fallow	August 4	Prior to cover crop planting	4	31
	Cover Crop	August 4	Prior to cover crop planting	4.1	39
	Fallow	October 6	Post-establishment of cover crop	4.5	103
	Cover Crop	October 6	Post-establishment of cover crop	4.8	43
V7	Fallow	August 4	Prior to cover crop planting	3.1	41
	Cover Crop	August 4	Prior to cover crop planting	3.6	35
	Fallow	October 6	Post-establishment of cover crop	3.7	90
	Cover Crop	October 6	Post-establishment of cover crop	4.4	31
V8	Fallow	August 7	Prior to cover crop planting	4.9	25
	Cover Crop	August 7	Prior to cover crop planting	4.3	30

Fallow	October 6	Post-establishment of cover crop	4.9	55
Cover Crop	October 6	Post-establishment of cover crop	4.7	33

Cover crop assessments

The cover crop quadrats in all fields had high levels of ground coverage compared to their fallow counterparts. All species but three (lentil, chickpea, and sorghum) were seen in the quadrats, although these were present at low levels elsewhere in the cover cropped areas.

Weeds were noted in some quadrats in the fallow treatments, though remained low in two of the three fields. On average, V8 had 51-75% weed or volunteer plant cover, while V6 and V7 had 0-25% weed cover (Table 9). Weed presence in the cover crop treatment was negligible, as many weeds were very small compared to the stand of the cover crop and tall weeds were sparse throughout all three fields.

Table 9. Ground cover evaluation summary based on rating scale assessing coverage from 1-4 for both treatments for a total of four quadrats per treatment per field.

	Average ground cover rating	
Field ID	**Fallow**	**Cover Crop**
V6	0.9	4
V7	0.8	4
V8	3	4

These results are observational, but a strong and diverse cover crop stand appeared to have lower weed pressure compared to the area left fallow. A local challenge with this BMP is destruction by birds feeding on the cover crop, so establishing a tall stand early is essential and not always possible if harvesting is late.

Conclusion and Next Steps

The overall objectives of the BC Living Lab are to increase adoption of tested best management practices (BMPs), understand barriers to adoption, and quantify the climate mitigation effects. The three BMPs tested were manure application to promote soil organic matter (SOM), split nitrogen application to improve nitrogen management, and planting of cover crops to provide fall cover, retain nitrate, and increase SOM.

Observational data were collected through this first year. Generally, potato yield and SOM tended to be higher in the areas where compost was applied. Petiole results showed increased potassium in the compost area compared to the standard practice when the four fields were combined. Potato yield and petiole nitrate levels were higher in the split nitrogen area than the standard practice area. Cover cropping provided high ground cover compared to areas left fallow, and soil nitrate post-establishment of the cover crop was considerably lower in areas that were cover cropped.

This was the first year of data collection for the BC Living Lab Field Vegetables group. Future years will focus on continuing to collect data on those BMPs to strengthen the confidence in the data. Compost trials should continue in the same field units to evaluate changes in soil properties overtime, which will mean that they will be tested under different cropping systems. Split applications of nitrogen should continue to be evaluated under potato growing systems with different varieties and field conditions. The fields used for the cover trial this year should be monitored next spring for the continued benefits of this BMP, and new fields could be incorporated to continue to evaluate the establishment performance and effect on soil health. Consistent soil sampling methods across all three trials should be implemented in the future, for baseline, post-harvest, and/or soil sampling post-establishment of the cover crop to be consistent with the Code of Practice for Agricultural Environmental Management code. Overall, this year's data collection provided a strong starting point for observing the environmental and direct grower benefits of BMP adoption.

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We are grateful to have been able to perform this research on the traditional and unceded territory of the xʷməθkʷəy̓əm (Musqueam), Sḵwx̱wú7mesh Úxwumixw (Squamish), səl̓ilw̓ətaʔɬ (Tsleil-Waututh), QayQayt First Nation, Kwantlen, q̓íc̓əy̓ (Katzie), Semiahmoo, Tsawwassen First Nations, kʷikʷəƛ̓əm (Kwikwetlem), and Stó:lō Nation.