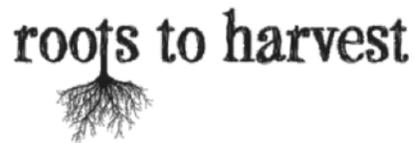


Ecological Agriculture, Food Security and Economic Prosperity in Northern Ontario Year One Report (2018-2019)

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Project Overview

The availability of healthy, locally produced food is essential for food security, ecological sustainability and economic prosperity. Building on the relationships with Lakehead University faculty, staff and students, the Lakehead University Agricultural Research Station (LUARS), Roots to Harvest, The Superior Seed Producers and a number of community partners, the *Ecological Agriculture, Food Security and Economic Prosperity in Northern Ontario* project's goals are to improve knowledge, skills and capacity to produce healthy and sustainable food in Northwestern Ontario. Adopting a community-based, participatory research methodology, the project has four broad objectives:

1. To increase access to ecological seed varieties adapted to Northern Ontario's agro-ecosystems through participatory, farmer-led research;
2. To support peer-to-peer knowledge exchange about seed saving and help farmers scale-up, diversify, and increase the quality of regionally adapted seed;
3. To improve biological conservation, food security and farmer livelihoods through improving the viability of ecological farming and food businesses; and,
4. To make LUARS a hub in Northwestern Ontario for ecological agriculture and sustainable food systems through strengthening partnerships with regional farmers, nonprofit organizations, small businesses and Indigenous communities.

The project was led by a team that included Drs. Levkoe, Galway and McLaren at the Sustainable Food Systems Lab¹ Lakehead University and community partners with expertise in ecological agriculture, including Roots to Harvest², Superior Seed Producers³, Bauta Family Initiative on Canadian Seed Security⁴, the Ecological

¹ The *Sustainable Food Systems Lab* is a hub for academics and community-based practitioners engaged in sustainable food systems research and action (<https://foodsystems.lakeheadu.ca>).

² Erin Beagle, Executive Director at Roots to Harvest, a non-profit organization providing educational and employment opportunities through agriculture and cultivate healthy communities (<http://www.rootstoharvest.org>)

³ Evalisa McIlfaterick, Owner/Operator of Root Celler Gardens and members of Superior Seed Producers, a collective of growers that promote saving and distributing locally adapted, sustainably grown, open-pollinated seeds, while educating and supporting about saving seeds (<https://superiorseedproducers.wordpress.com>)

⁴ Aabir Day, Director and Helen Jenson, National Research Program Manager of the Bauta Family Initiative on Canadian Seed Security, a Pan-Canadian organization working to conserve and advance biodiversity, maintain public access to seed, deliver research and training programs, and promote the wisdom and knowledge of farmers (<http://www.seedsecurity.ca>)

Farmer's Association of Ontario⁵, and the Lakehead University Sustainability Office. These primary partners helped to guide and implement the project and manage knowledge mobilization. With the establishment of the Lake Superior Living Labs Network (funded through a Social Science and Humanities Research Council Partnership Development Grant; www.livinglabsnetwork.org), the *Ecological Agriculture, Food Security and Economic Prosperity in Northern Ontario* project has become a keystone for the Thunder Bay Hub.

In the first year of the three-year project, we focused on establishing the partnerships and hiring a community grower at Roots to Harvest. We also focused our collective energy on feasibility and research planning to determine current needs, interests and capacity to meet the project objectives. We worked closely with staff at LUARS to prepare plots for ecological seed trials.

In year two and three of the project we will continue to develop the ecological variety trials and focus more directly on examining research questions that arose during the first year. We will aim to implement surveys, interviews and focus groups with farmers, nonprofit organizations, small businesses and Indigenous communities. We will also work more closely with other universities and colleges in the region and across the Lake Superior watershed that are involved in similar projects (supported by the LSLLN). For example, we will explore the development of the Food Bank Farm in Sault Ste. Marie, the Land Labs through the Eco-Entrepreneurship program at Lake Superior College in Duluth Minnesota, and success of the community farm at the University of Minnesota-Duluth. These projects will provide insights into ways they have developed community farms and outdoor classroom promoting teaching, research and public engagement related to sustainable food systems for all the economic, health, and ecological benefits it brings. We will also continue to explore possibilities of expanding the seed trials and work with northern and remote Indigenous communities through providing paid opportunities conduct seed trials. This phase will include farmer-to-farmer peer education and public outreach through workshops and knowledge mobilization activities and publications. We will determine future directions for the project with the partners.

⁵ Rebecca Ivanoff, Research and Seed Program Coordinator, Ecological Farmers Association of Ontario (<https://efao.ca>)

Budget

In 2018, the *Ecological Agriculture, Food Security and Economic Prosperity in Northern Ontario* project received a \$30,000 award from the Lakehead University Agricultural Research Capacity Development Program. The funding has been used to supported a community grower staff position (\$10,000/year) in partnership with Roots to Harvest. Through this partnership, the community grower spent approximately eight hours per week on the project and with the Roots to Harvest staff, played an important role in integrating the work into broader agroecological and food systems work across the region. Other contributions to the project included a cash contribution from the Bauta Family Initiative on Canadian Seed Security (\$500/year), and in-kind time and resources from all the partners. This included time and space in the Lakehead University Greenhouse and support from the Greenhouse Manager (Keri Pidgen) to grow seedlings, and the Superior Seed Producers helping to organize workshops and providing overall advisory duties. In addition, the SSHRC Partnership Development Grant entitled Lake Superior Living Labs Network awarded in 2019 will continue to contribute funds and resources to this project.

Project Activities

The project got underway in Spring 2019 with the hiring of a Community Grower in partnership with Roots to Harvest and a series of meetings with the project partners to plan the first season of the project. Much of the work focused on coordinating Canadian Organic Vegetable Improvement (CANOVI) carrot and pepper trials to determine varieties best suited for the region. In partnership with staff at LUARS, the team designated a plot of farmland to use for the CANOVI Project trials. In September, the team hosted a tasting event to evaluate the quality of the trials at the Thunder Bay Country Market. The team also worked with Roots to Harvest and the Superior Seed Producers to host a three-day event on agroecology, food security and seed saving in Northern Ontario in August. Discussions on the next stages of the project are currently underway as we evaluate the outcomes from the first year of the project. Currently the team is focusing on improvements to the LUARS site and expanding the trials for the 2020 season to include six garden plots at the Food Security Research Network (FSRN) Garden on the Lakehead University campus in Thunder Bay. Below is additional detail about the various activities that took place throughout year one of the project.

Canadian Organic Vegetable Improvement (CANOVI) Variety Trials

The variety trials are part of a national project coordinated by the Bauta Family Initiative on Canadian Seed Security to observe and participate in the CANOVI Project. The CANOVI Project works with the growers to determine the best parent line for breeding. Through participatory breeding, vegetable varieties are optimized for specific geographical locations and organic growing. The program worked with carrot and sweet bell peppers that came from seed trials in British Columbia. We grew five varieties of red carrots, sixteen varieties of orange storage carrot, and five early bell pepper varieties. These varieties were grown on three sites in the Thunder Bay area; Roots to Harvest's urban garden at 125 Lillie Street South in Thunder Bay, LUARS and Root Cellar Gardens both located southwest of the city of Thunder Bay.

LUARS (Site Replication One)

LUARS was selected because it was predicted this site would be equipped to grow an organic vegetable trial. We worked with LUARS staff to select appropriate plots in mid-April when the ground was still frozen and covered in snow. A 20 ft. by 40 ft. plot that

had not been used in the past years and protected by tree cover was determined to be the right amount of space needed to run the trials. Typically, LUARS is used for conventional agriculture that includes trials of chemical fertilizers. Because we were planting vegetable seeds that needed to grow organically, it was essential to select a plot that could protect the crops from pesticide residue in the soil and drift.

Site preparation was conducted by LUARS agriculture technician working at the research station. The plot was ploughed and disked twice to break up the large clumps of clay, the main component of the soil. Participants from the Roots to Harvest employment program Summer Horticulture Outdoors Worker (SHOW) contributed to the site preparation by broad forking and tilling before transferring seedlings and seeds to the soil on Monday June 17, 2019. Since chemical fertilizers had previously been applied to the soil and no other organic inputs were used, the soil was of extremely poor quality which limited the success of an organic trial. The organic component of the soil has not been maintained, shifting it to primarily a mineral substrate.

Another challenge of the LUARS site was the lack of a water supply. We did not have access to the onsite water for irrigation because it was saved for use in the building and their fertilizer sprayers. Water was driven in from outside the facility but this was difficult, time consuming and expensive. This was essential to ensure that the seeds and seedlings receive the water that they need in their early stages of growth. We received one day of sufficient rainfall in the three weeks following the planting of the seedlings. Following the rain, the seedlings received weekly water visits for three weeks. Bringing water to the site ceased following the three-visit due to the inefficiency of transporting water from town. To be able to continue vegetable trials, further investments are needed to establish the proper infrastructure to bring irrigation to the site. The lack of a water supply and the “dead” soil worked against the trial’s success. Despite these challenges, we continued with the trials at LUARS the site to evaluate how they would fare under these conditions.

The objective of this site replication changed due to the growing conditions and dependency on rainfall. We observed for consistent germination within the carrot varieties and which of the peppers would last the season with these water and soil conditions. Observations showed the majority of carrot trial varieties germinated sparsely (< 10 per 12 ft row). The tops of the carrots developed more than the roots because of the compaction of the soil. The tops would snap off if pulled, causing a pitchfork and water to be needed to observe root development. The pepper trials showed minimal growth since transplanting. They produced fruit but did not exceed 5cm in diameter and were inedible. Most of the trials were consumed by deer before *harvesting*.



June 17, 2019: Left to right Roots to harvest SHOW staff using the broad fork to loosen the clay 8-12 cm deep. This helped the carrots and peppers take root after planting.

Other opportunities to improve the trials at the LUARS site could have included adding mulch around the trials to help with moisture retention. As well as not using extra space by planting a cover crop, which would have led to increased soil fertility for the following season. More observation of the site may have led to a successful harvest of peppers and carrots.



August 12, 2019: Project partners observing the LUARS plot.

The following two tables summarize the data collected from the LUARS site. They indicate trials succeeding 10 germinates would be good parent varieties, orange storage carrots: Balolo F1 Check, Coral, Dolciva, Romance, Rumba, red carrots: Nurtri Red, Kyoto, Malbec. The Early Sweet Red pepper were the healthiest of the peppers under the extreme deficient conditions.

Table 1: Red Pepper Trials at LUARS Site

Red Pepper Trials	Trial Code	Over rating	Harvest	Notes, July 6	Seed Company
Ace	PB-04	1	0	Stunted, flowering, leaf curl	Johnny's Select Seed
King of the North	PB-05	1	0	Stunted, no flowers, no new leaves	High Mowing
Early Sweet Red	PB-06	2	0	Some growth, new leaves, flowereing	Turtle Tree
Orange Marmalade	PB-07	1	0	No growth, leaf curl, rough shape	Fruition
Peacework	PB-08	1	0	Stunted, flowering, leaf curl, some new growth	Pan American Seed/ball

Table 2: Carrot Trials at LUARS Site

Storage carrots	Trail Code	Germination	≥ 10 germ.	Harvest	Seed Company
Bangor	CA-26	X		0	High Mowing
Bololo F1 Check	CA-01	X	X	0	Johnny's
Coral	CA-23	X	X	0	Johnny's
Dolciva	CA-20	X	X	0	High Mowing
Dulcinea	CA-09	X		0	Fuition
Jerda	CA-25	X		0	Osborne
Nates di Chioggia	CA-16	X		0	Franchi
Nash's Nantes	CA-19	X		0	BC Eco Seed Coop
Naval	CA-21			0	High Mowing
Nelson	CA-28			0	West Coast Seeds
OSA Orange Flavoured Pop	CA-29	X		0	Organic Seed Alliance
Resistafly	CA-27	X		0	High Mowing
Romance	CA-24	X	X	0	Johnny's
Rumba	CA-14	X	X	0	BC Eco Seed Coop
Touchon Selection	CA-22	X		0	William Dam

Red Carrots	Trail Code	Germination	≥ 10 germ.	Harvest	Seed Company
Atomic Red	CC-01	X		0	Willhite
Nutri Red Carrot	CC-02	X	X	0	Osborne Seed
Kyoto	CC-03	X	X	0	Kitazawa
Malbec	CC-04	X	X	0	Johnny's
Vampire	CC-05	X		0	BC Eco Seed Coop

Roots to Harvest Lillie Street (Site Replication Two)

The Lillie Street urban garden is one of Roots to Harvest's urban agriculture sites and hosted the second replication of the carrot and pepper trials. Roots to Harvest has three designated plots for seed trials of 20 x 13 feet. A soil sample was taken from this site and the results indicated an adequate pH, organic matter, but low phosphorus. Cow manure was added to these plots as an organic method of working on the overall health of the soil. Plots were subsequently tilled and mounded into beds. The carrots and peppers were planted on Tuesday June 18, 2019. The carrot seeds received abundant hand watering by SHOW participants. They were thinned once but should have undergone a second round of thinning. We were unable to keep up with the weeds and encroaching grass. To avoid this problem in the future we will use straw as mulch to deter weeds and water conservation.

The trials at the Lilly Street site were quite successful which resulted in higher quality data. All red carrot varieties varied in size and shape and had some amount of splitting. The atomic red cc-01 and the Malbec cc-04 were the most uniform and a had a better flavor profile. The Kyoto Red carrot went to seed within the first season and would not select this carrot to be a parent variety. The orange storage carrots were successful from germination to harvest. Four varieties (Coral, Dolciva, Dulcinea, and Nelson) were vandalized in early August and further data collection was not possible. The storage carrots were much more uniform in shape then the red carrots and showed less splitting. The overall best two carrots varieties were Nash's Nantes and Rumba. Coral carrots had the highest in flavor but since they were vandalized they were not able to be checked a second time. The peppers at this site were quite successful. Each variety produced at least one red pepper before the threat of frost. The Peace Work variety was the overall the most bountiful with uniform peppers, but they had a thicker skin and less flesh making them less appealing to eat. The Red Ace and King of the North had the best flavor profile. Table 3 and 4 summarize the data collected from the Roots to Harvest Lillie Street Site.

From left to right Roots to Harvest participants and staff recording the germination rate and saving the carrots.



Table 3: Pepper Trials at Roots to Harvest Lillie Street Site

Red Pepper Trials	Trial Code	Appearance	Disease Resis	Earliness	Flavour	Marketability	Vigor	Yield	Seed Company
Ace	PB-04	4	4	3	4	4	3	4	Johnny's Select Seed
King of the North	PB-05	3	4	3	4	4	3	3	High Mowing
Early Sweet Red	PB-06	3	2	4	2	4	5	5	Turtle Tree
Orange Marmalade	PB-07	3	5	4	2	4	2	3	Fruition
Peacework	PB-08	5	5	3	3	4	5	5	Pan American Seed/ball

Table 5: Carrot Trials at the Roots to Harvest Lillie Street Site

Storage carrots	Trail Code	Appearance	Disease Resist.	Earli-ness	Flavour	Market-ability	Vigor	Yield	Seed Company
Bangor	CA-26	4	4	4	3	5	5	4	High Mowing
Bololo F1 Check	CA-01	4	4	4	3	4	4	4	Johnny's
Coral	CA-23	3	4	2	5	4	2	3	Johnny's
Dolciva	CA-20	4	3	3	3	3	3	3	High Mowing
Dulcinea	CA-09	4	3	3	3	4	4	4	Fuition
Jerda	CA-25	4	3	4	3	4	4	4	Osborne
Nates di Chioggia	CA-16	5	5	4	2	4	4	4	Franchi
Nash's Nantes	CA-19	5	5	3	4	4	4	4	BC Eco Seed Coop
Naval	CA-21	4	5	3	3	3	3	4	High Mowing
Nelson	CA-28	4	5	4	3	4	4	4	West Coast Seeds
OSA Orange Flavoured Pop	CA-29	4	4	4	4	4	4	4	Organic Seed Alliance
Resistafly	CA-27	3	4	4	3	5	5	4	High Mowing
Romance	CA-24	3	4	4	4	3	3	3	Johnny's
Rumba	CA-14	3	4	4	4	4	4	4	BC Eco Seed

									Coop
Touchon Selection	CA-22	1	4	4	4	4	4	4	William Dam
Red Carrots	Trail Code	Appearance	Disease Resist.	Earliness	Flavour	Marketability	Vigor	Yield	Seed Company
Atomic Red	CC-01	3	2	4	4	3	3	3	Willhite
Nutri Red Carrot	CC-02	1	2	1	2	1	2	1	Osborne Seed
Kyoto	CC-03	2	3	4	5	3	3	3	Kitazawa
Malbec	CC-04	1	1	4	5	1	3	3	Johnny's
Vampire	CC-05	1	4	4	4	1	4	4	BC Eco Seed Coop



From left to right: Dolcinea CA-09, Naval CA-21, Bangor CA-26, Nash's Nantes CA-19



From left to right: OSA Orange Flavoured Pop CA-29, Rumba CA-14, Bololo CA-01, Dolciva CA-20



Romance CA-24, Nantes di Chioggia CA-16, Jerda CA-25



Red Storage Carrots Kyoto CC-03 carrots seeding in their 1st season. Last image is CC-02 Nurti-Red Carrot.



CC-05 Vampire carrot, CC-01 Atomic Red, CC-04 Malbec

Root Cellar Gardens (Site Replication Three)

Root Cellar Gardens is a farm located about 40km southwest of Thunder Bay. The land has heavy clay soil which has been amended over the last few years with wood ash, peat moss, topsoil, and green manure cover crops. Crops are grown in raised beds, using ecological principles and with overhead irrigation. Timing for starting pepper transplants, and amounts of seed provided were very accurate. Carrot seed arrived later in the season than would normally be planted, and germination was sporadic across nearly all varieties in both trials. It was a cool, slow, spring, followed by a hot, humid six weeks of summer, and then a variable fall. The carrots did well in the trial, grew to maturity, and were harvestable well before the end of the season. Overall yield from the trial plots was lower than that farm's other carrot beds, but only because the germination was weak. The yield from the red carrots was lower again, because of carrots loss to bolting.

As the farm generally gets frost early in September, peppers were harvested large, but not yet ripe on September 2nd. A few of the peppers were starting to turn red and ripened indoors, but most stayed green. Yields from nearly all pepper varieties were equal to or above the yield off of the pepper varieties typically grown. The size/scope/requirements of the trials were well suited to Root Cellar Gardens, and they fit rather seamlessly into my operation.

The trials were very valuable with respect to helping me as a producer to familiarize myself with different varieties of carrots/peppers. This is hugely helpful when determining what varieties to grow for different end purposes. It is also really great to

be encouraged to pay closer attention to the crops as we grow. Doing the trials has also helped me to identify difference characteristics in these crops that I have previously overlooked (e.g., ease of harvesting peppers as a result of plant structure). Finally, I am excited to be able to compare results from this trial with other growers/plots in the region. As our growing region is so separated from any other, drawing conclusions based on results from distant farms is hard. Having the trial replicated at LUARS and Roots to Harvest offers a valuable comparison that controls for climate/region.



Pepper trials at Root Cellar Gardens

Lakehead University Greenhouse

Another activity of the project was a new partnership developed between the Lakehead University Greenhouse and Roots to Harvest. Kari Pidgen, the Lakehead University Greenhouse manager started the pepper seedlings for both the LUARS site and the Lillie Street site. Kari tended to the pepper seedlings until they were ready to transplant. She also became an important resource for the project providing support and feedback for some of our challenges working in greenhouses. Her support went beyond the vegetable trials and included additional advice for Roots to Harvest programs.



Seedlings growing in the Lakehead University Greenhouse

Carrot Tasting Event at the Thunder Bay Country Market

On Saturday September 21st, we hosted a Carrot Variety Tasting Event at the Thunder Bay Country Market. The objective was to get public impact about the quality of the carrot trials. At this event, three Orange and three Red Carrot varieties were chosen for sampling through a blind taste test. Participants sampled a variety and were then asked to rate the carrot variety on a scale of 1 (low) to 5 (high) for texture, sweetness, intensity and overall taste. Approximately 100 individuals sampled carrots and provided feedback. Besides collecting data, this was a fun community event that brought people together to talk about agriculture in the region, their favourite carrot, childhood memories of carrots and general conversations about growing. Table 5 provides a summary of the data collected about the quality of the different carrot varieties.

Overall, the carrot tasting event was a highlight of the project and should be replicated in future years. The sample size of six carrots (three orange and three red) for the tasting was a good amount of variety. Having the Community Grower at the event was important because they could talk about the specifics of the project and the work of growing the carrots. Having other project partners was also valuable to provide context for the partnership, the goals of the project along with sustainable food systems more broadly. For next year we would suggest the event be held later in the season (early October) to allow for the first frost to sweeten the carrots to see if that changes the quality. It would also be valuable to include peppers in the tasting if they reach maturity.

Table 5: The overall taste testing resulted in the following ranking and comments:

Carrot Name	Texture	Sweetness	Intensity	Overall	Comments
Nesh's Nantes	4.1	3.6	3.3	3.9	Nice and Crispy Really Good Not very sweet but good texture Taste like run of the mill It's what I expect from a carrot My favourite Bitter! Best of All
Nantes di Chioggia	3.9	3.1	3.1	3.6	It's a carrot Best one yet Flavour similar to sweet corn Terrible you need chicken compost It's very good Sweet and mild
Romance	4.3	3.7	4.3	3.8	Ok but dry My favourite Crunchy and sweet, favourite carrot Best one Mild sweet delicious Nice crunch, good overall, not sweet enough Easy to eat with dentures, crunchy but not hard Earth finish
Atomic Red	3.7	2.5	3.2	3.4	Interesting taste Not an interesting taste-bland Aromatic not sweet, neutral

					Perhaps different when cooked This is really nice, not sweet, Love it wish we had more of it Wow! Very earthy! Love it!
Nutri Red	3.6	2.6	3.5	3	A bit bitter, but ok Too earthy Bad after taste Wasn't as crunchy as the others but a bit bitter Overall decent, I would cook with it not eat it raw Excellent roaster carrot Nice texture, not sweet, a bit bitter
Malbec Red	3.8	2.5	3.4	3.4	Awesome crunch and colour Not too sweet but very flavourful Love the aroma and bitterness Good balance Rich and smooth I love the colour Comes out sweet at the beginning and bitter at the end



September 20, 2019: SHOW participants preparing carrots for sampling.



September 21, 2019: The project team setting up the carrot tasting event

Agroecology and Seed Security in Northern Ontario Workshop

In mid-August we hosted a three-day Agroecology and Seed Security in Northern Ontario workshop (August 11-13) in collaboration with the project. Rebecca Ivanoff from the Ecological Farmers Association of Ontario (EFAO) and Helen Jenson from the Bauta Family Initiative on Canadian Seed Security came to Thunder Bay to contribute to the workshop. Day one of the workshop began with a discussion on agroecology and seed security at Roots to Harvest. Day two included tours to different sites included in the project. And day three involved a seed saving workshop hosted at the Roots to Harvest Lillie Street site. The varied components of the event attracted different people and each of the three days were successful in their intention of creating a meaningful dialogue about seed saving and agroecology in Northern Ontario. Having representatives of EFAO and Bauta participate in the event allowed community members to learn from their knowledge and expertise.



Agroecology and Seed Security in Northern Ontario

Join us for discussions and an interactive workshop about ecological agriculture and seed security in Northwestern Ontario. This event is open to anyone interested in growing food or in learning more about sustainable food systems in the Thunder Bay area.

Sunday August 11 6:00 - 8:00PM

AGROECOLOGY AND SEED SECURITY IN NORTHERN ONTARIO

PANEL DISCUSSION + Q&A

- Charles Levkoe – Canada Research Chair in Sustainable Food Systems
- Superior Seed Producers
- Rebecca Ivanoff – Ecological Farmers Association of Ontario
- Helen Jenson – USC Canada
- Beau Bouchers – Fort William First Nations

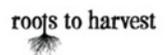
Tuesday August 13 9:30 - NOON

LILLIE STREET TOUR, INTRO TO SEED SAVING

- Why save seeds?
- Open pollinated, Hybrid, Heirloom, GMO
- Annual, Biannual
- Inbreeding, Outbreeding
- Pollination, Fertilization
- Isolation, Population size, Roguing
- Managing Seed Crop
- Harvesting and Processing
- Storage
- Germination

TO REGISTER email grower@rootstoharvest.org or call **285-8901** and indicate which workshop(s) you plan to attend.

REGISTRATION CLOSING AUGUST 8





August 11-13, 2019: Photos from the three-day Agroecology and Seed Security in Northern Ontario workshop

Recommendations and Next Steps

Reflecting on the successes and challenges of year one of the *Ecological Agriculture, Food Security and Economic Prosperity in Northern Ontario* project, we offer the following recommendations.

All sites should have soil samples taken and tested to determine what nutrients are missing. Based on the results, soil implements should be added. Having a complete set of soil samples will also help in interpreting the results of trials across different sites.

If trials are to continue at the LUARS, the soil will require significant amendments. This would include approximately three, twenty-two-ton loads of manure (\$600 plus a \$400 transportation) as well as topsoil additions to incorporate with the clay for easier tillage and added nutrients. Soil organisms are present but ideally their numbers would increase. Annual additions would also be required after the initial additions to further break up the clay. tillage radishes could be sown, as their tap roots will aid in breaking up the clay and enhance the movement of organic matter downwards (\$183/50 lbs. bag). Tillage radishes are killed off by frost and decay rapidly in the spring adding biomass and voids in the soil for air and water movement. The LUARS site will also require irrigation which is not currently available. We suggest exploring options for this in the coming years.

Until the LUARS site can be made viable for seed trials, we have decided to move the seed trials to the Food Security Research Network (FSRN) Garden on the Lakehead University campus. This site will provide better soil quality, it is already operating organically and there is access to water for irrigation. It is also much more accessible for community and student, staff, Faculty involvement. We have arranged to use six plots and have already prepared them by covering the soil with a tarp to suppress weeds. These plots have previously grown squash, zucchini, and cucumbers. We suggest adding compost/manure to the soil in the spring of 2020 when the ground thaws and the soil will be tilled. For successful germination, we will wait for optimal soil temperature to be reached. Straw will be added to prevent weeds and loss of water.

The Lillie Street site requires straw bales to help suppress weeds. Roots to Harvest has one bed worth of drip tape that can be laid down for the water sensitive seeds/seedlings.

We will also continue to work with our partners to expand sites for seed trials in 2020.

In year two we will work with the project partners to begin additional research in coordination with the Lake Superior Living Labs partnership project. Specifically, this will include research on climate disruption and seed security in the region. Partners have expressed interest in conducting a review of what seeds people in the region have used historically (e.g., literature review, interviews). We will also explore the needs for seeds in the region for food, medicine, native plants (e.g., interviews and focus groups).

Throughout the winter months (i.e., December 2019 to March 2020) the following tasks are proposed:

- Identify key research questions for years two and three of the project;
- Develop data collection and analysis plan;
- Continue to expand the network of farms and growing spaces that are participating in seed saving and seed trial initiatives;
- Identify new farms and growing space that could participate in the seed trials (and possibly seed saving initiatives) in the Thunder Bay Region;
- Identify other spaces where people are engaging in agroecology initiatives in the larger region;
- Integrate the project into the Lake Superior Living Labs Network;
- Train current staff and project participants in soil health, pest management, research methods, etc.;
- Recruit students to support the research elements of the project;
- Gather information from other farms and growing spaces in Southern Ontario that focus on agroecology, seed trails and seed saving initiatives; and,
- Draft an article in a popular forum about the insights from the first year of the project.