British Columbia Organic Grower

ORGANIC FARMING + CLIMATE CHANGE

soil

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In This Issue

A Family Farm Story

Sproule & Sons Farm in Oyama, BC has made its way to organic food production over the generations. *Read more on Page 8.*

Features

Cover Crops & Soil Health

Saikat Kumar Basu shares research on various cover crops and their virtues. *Read more on Page 16.*

BC Organic Grower

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On the Cover: Mary Alice Johnson of ALM Farm shows off seasoned farm hands. Credit: Thomas Buchan.

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Editor's Note

Muddy young feet at Forstbauer Farm. Credit: Thomas Buchan

By Darcy Smith

It rained last night, the first spring rain after a week of unseasonably warm March weather on the South Coast of BC. As I write this letter, my open window brings that familiar, evocative, earthy after-rain scent—produced, of course, by Actinomycetes, a genus of soil bacteria both ubiquitous and crucial to soil health. There's no question that healthy soils will be key to mitigating the effects of climate change. After all, soil organic matter holds more carbon than the atmosphere and plants combined.

The Spring 2019 issue of the BC Organic Grower pays homage to soil, the foundation of organic agriculture, with a special lens to the impact of climate change on soil health, and vice versa. As you dig into the earth this spring, planting seeds and tending crops, I hope the stories told in these pages reaffirm that the healthy soils being cultivated on organic farms across BC take us one step closer to a resilient world.

The issue kicks off with practical tools for testing soil and managing nutrients from Amy Norgaard, Dru Yates, and Emma Holmes (Ask an Expert, page 6). This collaboration from three women who know their soil stuff brings together so many great tips, plus a collection of resources, labs, and more.

Next, our Organic Story touches down in Oyama, BC at Sproule & Sons Farm as we learn about Neil and Jacqui's journey to organic, and the seasonal flow of feeding the soil on an organic orchard (page 8).

On page 12, DeLisa Lewis brings plants and animals together for a deep dive into how crop-livestock integration impacts soil health on her farm in Cowichan, BC. Page 16 features cover crops as a recipe to conserve healthy soil long into the future—and a reminder to never take this oh-so-valuable and non-renewable resource for granted. Rachel Penner from the Climate Action Initiative highlights soil management practices in three case studies focused on adapting to a changing climate (page 24). In Footnotes from the Field (page 20), Marjorie Harris digs into climate-change related biodiversity loss through a look at light- and temperature-sensitive ecosystem cycles.

On a lighter, and more celestial note, head over to page 22 and follow along as long-time Biodynamic farmer Anna Helmer tries to figure out just what Biodynamic farming is all about, and why does it work anyway? Stay tuned for more entries in this farm story to come!

Did you join us at #COABC2019 to celebrate all things organic? Flip to page 14 for a conference recap from Stacey Santos to relive the weekend—or, if you couldn't make it to Vernon, to get a feel for the highlights and join us in congratulating this year's award winners!

If you have a story to tell about organic food and farming, please get in touch. Reach out with your thoughts, letters, and story ideas to editor@certifiedorganic.bc.ca—and be sure to visit us online:

bcorganicgrower.ca

Farmers in workshop mode at the COABC conference. Credit: Darcy Smith

Budget 2019

BC's agriculture sector is set to see another funding increase, as laid out in Budget 2019. The funding allocated to the Ministry of Agriculture—a 5.4% increase as compared to 2018—continues to focus on the revitalization of the Agricultural Land Reserve (ALR), specifically by ensuring farmland is not contaminated by construction debris, toxic waste, and other fill, and by curbing the construction of mega-mansions on farmland.

There was a slight increase to the Agricultural Land Commission's budget for enhanced enforcement related to the revitalization of the ALR as well as for work connected to the new cannabis regulation. In further support of not only the agricultural sector but also the small business sector as a whole, the budget also revealed a small business corporate tax reduction from 2.5% to 2%.

As mentioned in the Speech from the Throne, given a week prior to the budget release, the "government will be launching a food security task force aimed at bringing more farmland into production and growing new produce for markets here and abroad." This taskforce, though not a budget item this year, will further aim to create a sustainable agriculture sector by driving innovation, jobs and production.

COABC's Executive Team

At the 2019 AGM, COABC voted in a new executive team:

- Co-President, **Carmen Wakeling** of the Pacific Agricultural Certification Society
- Co-President, **Heather Stretch** of the North Okanagan Organic Association,
- Treasurer, **Tristan Banwell** of the North Okanagan Producers Association,
- Secretary, **Niklaus Forstbauer** of the Bio-Dynamic Agricultural Society of BC.

Stacey Santos

Welcome to our New Communications Manager

We're pleased to welcome **Stacey Santos**, our new Communications Manager, to the COABC team! Stacey is taking over for Darcy Smith, who is staying on as editor of the BC Organic Grower.

Based in Victoria, Stacey brings with her a passion for creative communication, community engagement and healthy, sustainable living. She has a background in communications, creative

writing, digital marketing and web design and has worked in the non-profit sector for several years.

As Communications Manager, Stacey will work to generate positive awareness of the COABC and organics in every way possible: managing social media channels, writing web content, promoting sector events, growing media contacts, gathering info for the monthly e-newsletter and finding new ways to engage and inspire the growing organic sector in BC! She'll also be working to streamline communications within the COABC itself in order to better harness the incredible amount of knowledge within the organization.

If you have news, events, photos or other information to share, or if you have ideas on how to better tell the story of organics in BC, you can reach Stacey at:

communications@certifiedorganic.bc.ca.

Updates to the ALR

On February 22, 2018, changes to the Agricultural Land Reserve (ALR) came into effect. The new regulations address three critical issues impacting the ALR: fighting mega mansions and other non-farm use, ending the dumping of illegal fill, and ending the two-zone separation of the ALR.

For a breakdown of the new regulations, visit:

youngagrarians.org/whats-new-bill-52-changes-alr/

BC Laws features the full regulation, with changes highlighted in green:

bclaws.ca/Recon/document/ID/freeside/00_02036_01

Organic Price List

The Organic Price List for fruits and vegetables is updated weekly on the COABC website. The Organic Price List is an important market pricing reference to help growers sell without overcharging and losing sales, or worse, undercharging and eroding the market price for other growers.

Check out the Organic Price List here:

certifiedorganic.bc.ca/services/organicpricelist.php

COG: Join National, Support Local

A strong and sustainable organic sector in Canada depends on dedicated involvement in local organic food systems—and a strong national organization made up of farmers and consumers devoted to organics. For more than 40 years, Canadian Organic Growers (COG) has been building and transferring knowledge on organic farming so that our sector grows and becomes stronger. COG creates awareness within our sector and to the public about issues that directly affect organic farmers and farming.

By becoming a member of this national organization, you add your voice to our national voice—while also supporting COABC! Canadian Organic Growers (COG) allows members and supporters to direct a portion of their membership contribution to their regional organic organizations, including COABC.

By joining COG for $25, you can choose for $15 of your membership to go directly to COABC, and you will be supporting our projects and programs that take place at the provincial and local level.

cog.ca/cog_news/cog-launches-join-national-support-local-membership-campaign/

BC Land Matching Program

The BC Land Matching Program (BCLMP) delivered by Young Agrarians provides land matching and business support services to new farmers looking for land to farm as well as landowners interested in finding someone to farm their land. Offered since 2016 in Metro Vancouver, the program is now available in four regions: Vancouver Island, Metro Vancouver, Okanagan, and Columbia Basin. If you're looking for land to lease, or interested in leasing your land to a farmer, reach out to find out how a Land Matcher can support you.

For more information, email land@youngagrarians.org and visit:

youngagrarians.org/land

SOIL TESTING TOOLS
FOR YOUR NUTRIENT MANAGEMENT TOOLBOX

Amy Norgaard sampling soil. Credit: Teresa Porter

By Amy Norgaard, Dru Yates, & Emma Holmes

Every year farmers align countless variables to produce healthy crops that make it to market. Crop planning. Bed prep. Transplanting. Irrigation. Weed management. Pest management. Harvest. Storage and transport. Typically, there is a sweet spot in terms of either quantity or timing for each of these, and there are indicators or measures to stay in that ideal range. For example, the weather forecast and local temperatures highlight best times for transplanting, thermometers track temperatures in storage facilities, and in-field insect traps help monitor pest pressures. Nutrient management is another one of these farm management components that we can stack in our favour—and soil sampling is an essential tool to make informed decisions in this area.

The main reason for soil sampling in agriculture is to assess soil fertility and related properties like pH and texture. Results not only inform management practices for the current season but can also act as a report card for past decisions. Just like we can feel or measure the soil to make irrigation decisions, we can use soil tests to provide us with a snapshot of fertility status and amend accordingly. Being able to apply the right nutrients in the right quantities is just another opportunity to add another piece to the puzzle on the way to our yield, quality, and/or productivity goals.

Best Practices for Taking a Soil Sample

When collecting soil for analysis, the goal is to obtain a sample that is representative of the area you are interested in. Since soil properties vary across fields, there are several steps to ensuring the most reasonable average possible.

1. Take several sub-samples from your area of interest and mix them together to get a composite sample:

   - If your garden plot is small (100 – 200 sq. ft), take 4 – 5 samples.
   - If your garden is larger (500 – 10,000 sq. ft.), take 9 – 10 samples.
   - If you are measuring a larger area (i.e. 1 – 25 acres) and that area is relatively uniform in cropping and management history, take about 15 – 30 samples to make your composite sample.
   - If your sample area is larger than 25 acres, try to arrange your sampling areas so that a single composite sample does not represent more than 25 acres.

2. Avoid spots that look different from the rest, or that have been managed differently. For example:

   - Wet spots in an otherwise well drained field.
   - Areas where plants are growing exceptionally well, or exceptionally poorly compared to the rest of the field.
   - Greenhouses that are left covered over winter.
   - If you are curious about an area that is different from the rest, sample it separately.

3. Make sure each sub-sample is the same volume and is taken to the same rooting depth (usually 6 inches for most nutrient tests).

4. Collect samples randomly from the entire field area. A soil probe is the ideal tool as it is fast and ensures consistency among depth and volume of samples, but if you don't have one readily available, a trowel or garden spade works well. You will also need a bucket and plastic bags. It helps to pre-label the bags with the sample name using a sharpie so that samples don't get mixed up! Clean any equipment that comes into contact with the sample (eg. shovel and bucket) with clean potable water and dilute soap.

5. Start collecting samples from the sampling area and add into the bucket. Remove any bits of vegetation, pebbles, or fauna with a gloved hand. Once you have all your sub-samples for your area in a bucket, mix them together and take a ½ cup of soil and put into the prelabeled ziplock bag.

6. Repeat for other samples, making sure to clean your tools between sites.

For more details on taking a soil sample, please refer to this factsheet, which can be accessed by searching for 'Soil Sampling for Nutrient Management' on the BC Ministry of Agriculture website: gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/agricultural-land-and-environment/soil-nutrients/600-series/631500-1_soil_sampling_factsheet_no2_sep2010.pdf

Due to inherent variability in analytical methods, two labs can provide different values for the same nutrient of interest because labs use different extraction methods and equipment. Even when using the same method there is lab to lab variability. Therefore, it is important to use the same lab consistently to monitor trends over time. It is also important to take into consideration the methods used when analyzing the results.

On Testing Compost and Amendments (It's a Good Idea)

Composts are commonly used in organic agriculture as a source of organic matter and plant nutrients. However, these amendments vary widely in their composition depending on many factors, such as feed-stock, composting process, and storage conditions. These not only affect the initial nutrient content, but also influence nutrient loss prior to spreading, as well as the soil nutrient dynamics (release and availability to crops) when the amendment is spread in the field. Therefore, testing a compost pile shortly before spreading gives us the best snapshot of its composition and represents another tool in our toolkit when making site-specific nutrient management decisions in systems using these products.

Soil Labs

AGAT Laboratories
120 - 8600 Glenlyon Parkway, Burnaby, BC V5J 0B6
Phone: (778) 452-4000
Web: agatlabs.com

Exova (formerly Bodycote/Norwest)
#104, 19575 - 55A Avenue, Surrey, BC V3S 8P8
Phone: (604) 514-3322 Fax: (604) 514-3323
Toll free: (800) 889-1433
Web: exova.com

Maxxam Analytics (formerly Cantest Ltd.)
4606 Canada Way, Burnaby BC V5G 1K5
Phone: 604-734-7276 Toll-free: 1 (800) 665-8566
Email : info@maxxamanalytics.com
Web: maxxam.ca

Ministry of Environment Analytical Laboratory
4300 North Road
PO BOX 9536 Stn Prov Govt Victoria, BC
Phone: 250-952-4134
Email: NRlab@gov.bc.ca
Web: gov.bc.ca/gov/content/environment/research-monitoring-reporting/research/analytical-lab

MB Laboratories Ltd.
By Courier: 4 - 2062 West Henry Ave, Sidney BC V8L 5Y1
By Mail: PO Box 2103, Sidney BC V8L 3S6
Phone: (250) 656-1334
Email: mblabs@pacificcoast.net
Web: mblabs.com

Pacific Soil Analysis Inc.
5 – 11720 Voyageur Way, Richmond BC V6X 3G9
Phone: (604) 273-8226
Email: cedora19@telus.net

Plant Science Lab (affiliated with TerraLink Horticulture Inc.)
464 Riverside Road, Abbotsford, BC V2S 7M1
Phone: (604) 864-9044 x1602
Email: pwarren@terralink-horticulture.com

Composts can be tested for a variety of properties, including both macro- and micro-nutrient content, carbon to nitrogen ratio (C:N), pH, electrical conductivity (EC), organic matter content, etc. Together, these provide an overall picture of compost quality and can help predict the subsequent effects on soil quality and nutrient supply to crops. The specific parameters to test for depend on the goals for using the product, and any specific concerns or goals. For example, farms that already have salinity issues may want to test potential soil amendment sources for EC as an indi-

Continued on page 28...

SPROULE & SONS FARM: PAST TO PRESENT

Jacqui and Neil Sproule. Credit: Marjorie Harris

By Neil and Jacqui Sproule with gratitude to Marjorie Harris

Garnet and Charlotte Sproule bought a raw piece of land in Oyama in 1946. They built a small shack and started planting a few fruit trees. They also started their family, which eventually grew to five children, all raised and educated in Oyama. They farmed the land until 1992 when it was time to retire. Their eldest son Neil and wife Jacqui then purchased the farm and raised their five children on the farm, continuing in the family tradition! They still live in the same old farm house (and have been renovating for 25 years).

Towards Organic

The fruit was farmed conventionally from 1946 to 1992. Neil and Jacqui had concerns about the pesticides and the glyphosate used to kill all the grass and bugs around the trees. When Neil sprayed the farm, clothes had to come off the line, all the windows had to be shut, and the children could not play outside. It was at that moment that Neil and Jacqui decided to convert to organic—with no support from family or neighbour farmers at the time. They had always respected the environment and the land on which they farmed, but going one step further to become certified organic was a way to affirm their commitment protecting the health of the land, air, water, animals, wildlife and people.

In the beginning some mistakes were made—low yielding crops, small fruit, insect damage—but they had beautiful green grass, open windows, and happy, playful children. Neil and Jacqui knew they were on the right path. They grew with knowledge through mentors and a hired consultant and in a few short years they were producing high quality organic fruit. As they became more confident in their farming practises, they rented neighbouring land and replanted.

Peaches ripening on the tree. Credit: Sproule & Sons Farm

Today, they farm 22 acres of cherries, peaches, nectarines, plums, apricots, grapes, and apples—all organically, of course. It has been a learning curve for the owners of the property that the Sproules lease for their orchards, as the landowners must also comply with organic practices. As it turns out, the owners of the leased land quickly learned that the lack of pesticides made their environment much more livable and they all have found that the benefits of organic land far outweigh the weeds on their lawn.

Seasonal Flow

Tree fruits by nature have a unique seasonal flow. Every winter, the Sproules haul manure to the farm to kick start the composting process. The compost pile heats up to 130-140 degrees for several days, and decomposing is finished in six weeks, ready to return nutrients to the earth. Come spring, Neil spreads the composted manure under the trees. Beginning in the early spring just before the blossoms open, bees are brought to the farm in hives. Once the blossoms are open and the temperature is up, the bees get busy pollinating all the fruit trees. Each type of fruit blossom smells different! Summer brings the bounty of harvest season.

Pruning is done between October and March, to invigorate the trees and allow light for bud and fruit development for

Sproule & Sons fruit processing room. Credit: Marjorie Harris

the following season. After the pruning is completed all the branches are mulched up to be put back into the soil.

Self-Sufficient from Tree to Market

As they produced more and more fruit, the Sproules needed somewhere to store it all. They built a red barn, which has become a key part of their marketing strategy, and took the unique step of doing their own fruit packing, sorting and grading right on site, so all of their fruit goes directly from the trees to the cooler.

They bought a second hand hydro cooling system and a sorting table for the cherries, cold storage for the fruit and a commercial kitchen to cut and freeze peaches. The hydro cooler packs approximately 5,000 cherries per day with a staff of 50 people to pick and sort the cherries.

They have also built accommodation for the staff on the home property, with two fully equipped kitchens, hot showers, flush toilets, BBQ, WIFI, washing machine, tenting area and ping pong table and bikes. The workers pay a fee of $5.00 per day which is re-invested into the camp. Every other year they hire a mobile juicing business to come in and juice the second-grade cherries. The juice is packaged in glass jars and sold on farm or farmers markets. The Sproule's farm website is updated daily during the growing season so the community can find out what is

being harvested. Over the years, the farm has hosted tours to showcase the sustainability practices and, of course, show off that red barn!

A Family Farm—Now and in the Future

In 2018, the Sproules received the Family Farm Award from the BC Institute of Agrologist's Okanagan Branch for their multi-generational operation and excellence through organic agriculture. The award recognizes a family-oriented farm in the Okanagan Valley that demonstrates innovative practices as well as implementation of outstanding environmental values.

In a growing corporate farming sector, the Sproules are proud to have maintained a small family run organic farm—and are prouder still to announce that their eldest daughter Brooke with her husband Tanner and baby Hadley will be purchasing the farm in the next five years.

A third generation family farm—now that is progress!

sproulesredbarn.com

Neil and Jacqui Sproule farm at Sproule & Sons Family Farm. Just look for the red barn!

Bringing Plants and Animals Together for SOIL HEALTH

Crop-Livestock Integration at Green Fire Farm

Cows at GreenFire Farm. Credit: DeLisa Lewis

By DeLisa Lewis, PhD

What do the North American Dust Bowl of the 1930s and the current global experiences of climate change have in common? Of course, both are understood as environmental disasters with humans as major contributors. But, if you answered with either 'farmers' or 'soils,' or more ideally, both, you'd be hearing a celebratory ding-ding-ding right about now.

For farmers and their soils, however, the 'answers,',in the form our day-to-day management are not so simple. Environmental historians have uncovered a picture of the Dust Bowl that is also less simple than the above equation, (e.g. Worster, D. 2004; Cunfer, 2004). True to the story I would like to tell here, these historians do focus on some of the challenges of long-term management of soils. Geoff Cunfer, an environmental historian of the Great Plains, found just how much 'manure matters' and asserted, "Through 10,000 years of farming on five continents by hundreds of diverse human cultures, only a handful of solutions to soil fertility maintenance have emerged" (Cunfer, 2004: p. 540).

What I've learned from reading environmental and agricultural history accounts, as well as reviewing the findings from long-term agricultural research studies[1] is that careful, and regionally specific considerations of soils and climates are key nodes for fine-tuning systems. Perhaps more importantly, farming operations, including organic ones, have become increasingly specialized with livestock and manure here and vegetables over there. The lessons from history and long-term agricultural research, point towards diversity, and combined strategies for soil fertility or soil health.

I did not reach a place of digging around the archives or agriculture research station reports until I had close to 15 years of practice with soil management on certified organic vegetables farms. My farming systems experience to that point was within specialized, vegetables-only operations where I managed the soil preparation of the fields as well as windrows of compost with the front-end loader on my tractor.

When I arrived in British Columbia to learn more about the science behind soil management practices, some of the immediate lessons learned centered on the very different soil types, climate characteristics, and economic and cultural realities here. I now have just over a decade of 'living here' experience in the Coast-Islands region of BC, and am moving into year five operating our family-owned farm in the Cowichan Valley. That background is meant to highlight that I am still learning, and what I want to share for the purposes of this article on soil health and climate change, is my journey so far with integrating livestock with vegetables on Green Fire Farm.

Although coping with 'too much and too little' available water is not new to farmers in the Coast-Islands regions of BC, frequent and extreme weather events do present a new set of challenges. Faced with the demands of producing high quality product in competitive markets, and rising costs for farm inputs, we decided to pursue a number of

different strategies to meet the goals of farm profitability, risk reduction, and (my personal favourite) soil health.[2] The overall strategy is diversification, both in the fields and in terms of different revenue streams for the farm.

The soils and climate of our farm are well suited to a mixed farming operation, with Fairbridge silt loam soils[3] and a Maritime Mediterranean climate. The soil landscape would be described as 'ridge and swale', with differing slopes and mixed drainage patterns interspersed through the fields. The drainage limitations of these soils and the erosion prone sloping areas are key pressure points for early spring and late fall field soil preparations. Though I have attempted to address some of these potential challenges to soil health with carefully timed tillage,[4] and the use of a spader to reduce mechanical disturbance, the loss of production from one to two weeks at both ends of the growing season can be a costly hit to our farm profitability.

With that in mind, I see necessity as a driver with my decision-making around farm enterprise diversification. I did not arrive on our farm in the Cowichan with all the knowledge or skills required to integrate livestock with our vegetable production, but I did arrive with a keen interest in learning what mix of systems could optimize the opportunities and limits of our farm's unique mix of soils, climate, and markets. Nearly five years in, we grow and sell a diverse mix of annual vegetables, perennial fruits, hay, and pastured pork. In recognition of the limits to my own management capacity, the addition of each new layer of complexity to the system is small and incremental.

I braved the unknowns of bringing in weaner piglets in the first season because we did not have enough irrigation water at that time to set up the vegetable systems that were most familiar to me. We began our learning with pastured pig systems with a total of eight piglets.

Last spring, we found another certified organic farm in our valley who were ready to sell their small herd of four lowline Angus beef cows. With their mentorship and guidance, I've added a system of 'modified'[5] intensive grazing to our pastures. In addition to purchasing the cows, our investments were increases to our electric fencing equipment used with the pigs, additional livestock watering tanks, and a used set of haying equipment.

This spring, I plan to set up smaller paddocks using the electric fencing where I want the cows to terminate the overwintered cover crops. This would be my 'holy grail'[6] system for putting in practice both soil health principles and climate friendly strategies, and much additional research will be needed to evaluate the return on investment and to quantify the contributions to soil health or climate impacts mitigation.

Currently, I have more questions than answers with respect to a full assessment of how this crop-livestock integration performs on our farm. As one part of our response to that, we will be expanding our record-keeping systems in an effort to learn our way towards an evaluation. Connecting our farm efforts to the work of others as recorded in

continued on page 30...

2019 COABC Conference Recap

Rebecca Kneen (left) and Corey Brown (right) present Lisa McIntosh (centre) with the Brad Reid Award. Credit: COABC

By Stacey Santos

One snowy Sunday morning in Vernon, I found myself contemplating a selection of bolt guns. I listened as a panel of organic farmers explained their uses, their modifications, and the proper way to ensure an ethical death. You only have one chance to learn how to do it right and do it properly.

It was an unusual weekend morning for sure, but particularly for me. As a long-time vegetarian and the kind of person who can't willingly kill a mosquito, I never imagined I'd be part of a discussion on on-farm slaughter. Or that I'd be engrossed, not grossed out. Or that one of my most burning questions would be answered: How can we raise animals, create a relationship with them, and then kill them?

One of the presenters, Rebecca Kneen, said, "We have an ethical and dynamic relationship with livestock. They've been bred over thousands of years to depend on us. Look at it as an intergenerational bargain we're having with these species. We must provide them with a good life and a good death in exchange for being able to use their products. Figuring out how to do it well is critical and I prefer to control all aspects of that process."

A well thought out answer, and a fine balance of science and heart.

That's the thing about the COABC conference—and the organic sector as a whole. No matter what aspect of organics is being discussed, the passion and dedication is contagious. I've never met such an engaged bunch of people. And the knowledge, well, it's off the charts. You'll find yourself rethinking past notions, exploring new ideas, and, keeping in tune with this year's theme, "Celebrating Organics," having a great time doing it!

This undercurrent was woven throughout the entire COABC conference weekend. With 18 workshops on an incredible array of organic topics plus many other formal and informal information-sharing and social sessions, it was a weekend to remember!

Growing the Organic Sector

The keynote this year was a plenary-style panel featuring Rebecca Harbut, Andrea Gunner, and Rob Borsato, moderated by Rebecca Kneen. As is typical with plenary sessions, each panelist contributed their own unique views on everything from marketing to research to the principles of organics. It was a spirited discussion with many important points:

- A true consumer appreciation for organics is still a ways away
- The organic community needs to advocate more effectively and help the public understand the bigger picture
- Organic growers and researchers need to collaborate to co-create knowledge and allow it to be something meaningful and valuable that harnesses everyone's expertise
- When it comes to organic farming, complexity doesn't mean nonsense—it means complexity

What it boils down to is many individuals spreading the word! So join the listserv, get involved with your Certification Bodies and get out in the community. The more involved we are the more excited and educated people will be about organics!

Paddy Doherty and Carmen Wakeling (centre) present Rochelle Eisen (left) and Anne Macey (right) with the inaugural Bedrock Award.. Credit: COABC

Basics and Beyond

The hardest part of the COABC conference is picking which sessions to attend. Some conference-goers bounced between workshops to take in as much as possible, while others, such as myself, picked one that stood out and stuck with it.

As a newbie to the world of organic farming, I knew for sure I wanted to attend the Organic Standards Bootcamp with Dr. DeLisa Lewis and Dr. Renee Prasad. There were many other fresh faces there (many new to organics and even more to the conference itself), but the room was also packed with folks looking to get back to the basics and refresh their knowledge.

The session outlined the recent introduction of the mandatory organic regulations, walked through the certification process and highlighted the many toolkits available to both new and existing farmers. We were all given a chance to test our knowledge with "simple" questions, but quickly realized that when we applied the organic standard, the questions weren't so simple after all! There are many tools available, so the trick is to invest the time to find and understand them.

Many of the other sessions involved a more in-depth look at organics, with topics that included climate change, regenerative agriculture, marketing, intercropping, management-intensive grazing, weed control, financial management, policies, animal welfare, human rights, and much, much more. There was so much to be learned on so many levels, and thanks to regular—and generous—snack breaks, we all left with our brains and stomachs full.

The Award Goes To...

Congratulations to this year's award winners! Lisa McIntosh of Urban Harvest Organic Delivery was the recipient of the Brad Reid Award, which honours an innovative leader who has strengthened the organic community by moving the sector forward. Anne Macey and Rochelle Eisen took home the Bedrock Award, which is a brand-new award given to a person (or persons) for their work on the foundations of organics.

Moving forward

Before the AGM kicked off on Sunday, Michelle Tsutsumi and Rebecca Kneen wrapped up the conference by summarizing the ideas gathered at Friday's Open Space session. Then, with an army of flip charts by their sides, they opened up the conversation and invited everyone to comment on the challenges and opportunities faced by the organic sector. Some of the main takeaways were:

- Staying connected: overcoming isolation/geography by building networks that carry beyond the conference
- Strengthening the organization by offering educational workshops in your own communities
- Increasing brand recognition through the use of the Checkmark logo
- Building relationships with non-organic farmers and producers and inviting others to learn about organics
- Mentorship: transferring knowledge both inside and out of the organization

Thank you!

A big thanks to Samantha Graham for organizing this incredible event, Natalie Forstbauer for putting together a hugely successful silent auction, and MC Jordan Marr for keeping the program flowing and the laughs rolling. And also to the event sponsors, volunteers, hotel staff, and food donors for contributing to this amazing weekend. We couldn't have done it without any of you!

And another round of thanks to everyone who attended for being so welcoming, so helpful and so open to sharing your knowledge and exploring new ideas. The organic community is an incredible one and I look forward to seeing what we can accomplish in the coming year!

SOIL HEALTH & COVER CROPS

A recipe for success in achieving long term soil conservation

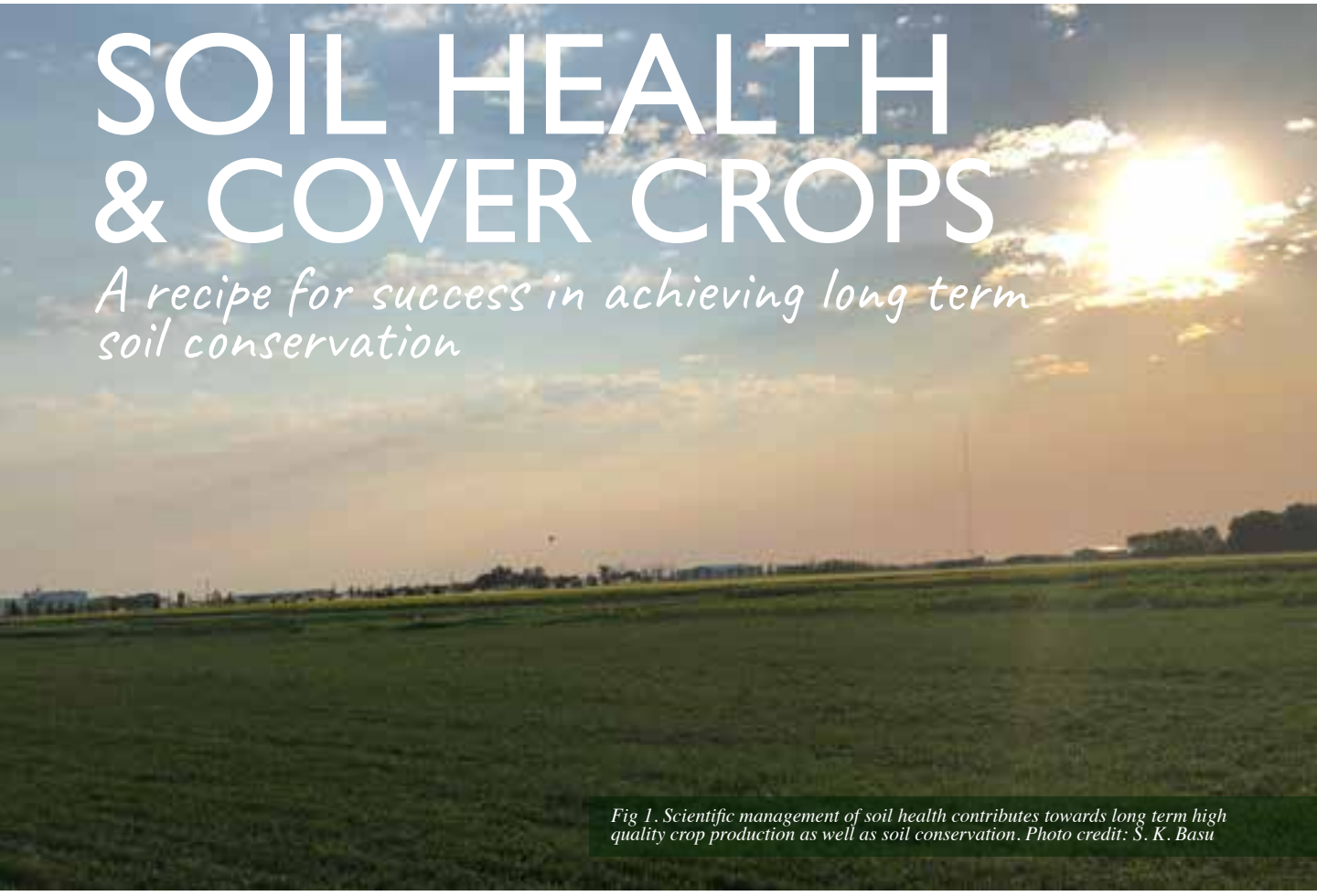

Fig 1. Scientific management of soil health contributes towards long term high quality crop production as well as soil conservation. Photo credit: S. K. Basu

By Saikat Kumar Basu

Why Care for our Soils?

Soil is an important constituent of both agriculture and forestry; unfortunately, it is taken for granted most of the time. It is a cheap, easily accessible or available global resource for which we have often forgotten to take the necessary care. We have used it non-judiciously without proper planning and vision for the future.

The concept of soil health has always been there since the dawn of human civilization—but only quite recently have we started to better understand, appreciate, and care for our soils as part of sustainable agriculture. We as humans have possibly matured over time and realized that our exploitative and non-judicious use of our soil resources can limit our long-term agricultural productivity and jeopardize successful crop production.

Unless we are serious enough to take good care of one of our most abundant yet highly sensitive natural resources of this planet, the soils, we ourselves will be solely to blame for the degradation of our soils—thanks to the self-destructive approaches we've used to achieve very short-term objectives of making easy profits without thinking deeply about the long-term consequences.

Soil health today has emerged as an important aspect of proper soil management as a component of sustainable agriculture to help in quality crop production without depleting or damaging soil quality and helping in proper soil conservation at the same time (*Fig. 1*).

What Impacts Soil Health?

Several factors impact soil health, among the most important being over application of fertilizers and pesticides. The soil represents a dynamic ecosystem and an intricate playground of delicate physics, chemistry, geology, and biology. Any chemical application on the soil therefore has some positive or negative impact on the soil quality by interfering with the physicochemical and biogeological processes associated with soil formation. These changes include shifting the soil pH due to various anthropogenic activities that slowly impact the soil quality. Drastic reduction in pH makes soil acidic, while rapid increase in pH leads to alkalinity or salinity; both conditions make the soil unsuitable for a long time for quality crop production. Furthermore, increased emphasis on monoculture associated with our modern industrial agriculture year after year depletes the soil of essential macro and micro nutrients necessary for maintaining optimal soil health (*Fig. 2*).

Photos: Fig 2. Increased emphasis on crop monoculture is detrimental to long term soil health. Fig 3. Untended soil is subjected to weed infestation that interferes with quality crop production. Fig 4. It is important to keep track of weed and pest species impacting crop production in a particular field for making judicious decisions regarding appropriate chemical applications at the appropriate stage and dosage following manufacturer's instructions. Fig 5. Mustard cover crop in full bloom. Fig 6. Perennial forage legume sainfoin is an excellent cover crop that can be successfully used in crop rotation cycles. Sainfoin is also exceptional for pollinators, attracting bees and other insects in large numbers. Fig 7. Hemp is a new speciality crop for Canada and has been generating serious interest among farmers for agronomic productions. Hemp has been found to attract diverse species of insect pollinators too. Credit: S. K. Basu

Over application of synthetic chemical fertilizers and various pesticides to secure crop production adds too much pressure on our soil, impacting not only the physicochemical and geological processes active in the soil, but also negatively impacting the soil macro and micro flora and fauna devastatingly over a long period of time. Several beneficial microbes like soil bacteria, Cyanobacteria, soil fungi, soil borne insects, spring tails (Collembola), earthworms, and other critters essential for maintaining soil health suffer population collapse due to non-judicious over application of synthetic fertilizers and pesticides.

Fig 8 Cover crops rotations can be an effective long term solution for managing optimal soil health with long term positive impacts on soil quality and soil conservation. Credit: S. K. Basu

Many such chemical residues remain in the soil for prolonged period and often percolate deep into the soil, reaching the groundwater table or adjacent surface fresh water resources via surface run off, with long term negative impacts on both soil and water. Often the beneficial soil macro and micro flora and fauna are altered or replaced by harmful species that prove detrimental to soil health and significantly impact crop production and forest ecology. Random unplanned crop rotations and fallow harm our soil more than we actually realize; making them susceptible to weed and pest infestations (*Fig. 3*), loss of precious top soil and lower crop production due to poor soil health.

Best Management Practices (BMPs) for Promoting Sustainable Soil Health

To maintain optimal soil health for long term success in achieving quality crop production we need to take necessary steps and plan carefully. This takes needs patience, and deeper understanding, as well as painstaking observations to implement good soil health practices on cropland.

Regular soil tests are important to ensure that we are aware of the excesses as well as depletion of necessary macro and micro nutrients in the soil. We also need to look into the topography of the crop field, the low and high spots in the field, the areas impacted by acidification and salinity issues, detailed history of fertilizer and pesticide applications over the years and the successive crops grown. Any past issues associated with the soil should be recorded for future reference. The nature of pest and weed infestations should be recorded to identify any specific patterns with respect to local pest and weed populations. Such detailed record keeping together with advanced GPS- and GIS-generated high-quality images of the field over the years will provide a farmer or crop producer or a professional agronomist ample reference to make judicious decisions to secure comprehensive soil health strategy and crop management for the future.

Based on the above information, we need to adopt a specific crop rotation plan to ensure that the soil is not exhausted of essential soil nutrients. Application of fertilizers and pesticides should follow manufacturer's guidelines stringently to avoid over application (*Fig 4*).

It is also important to note if soil compaction is causing a problem for the field. If this is an issue, then highly mechanized farming activities and movements of heavy vehicles need to be restricted to a specific easily accessible area to reduce negative impacts of soil compaction on the field.

Intercropping could be practised depending upon the farming need and also to use the soil resources judiciously. This can enhance crop production and add crop diversity to the field important for maintaining soil health.

Role of Cover Crops in Promoting Long-Term Soil Health and Soil Conservation

Cover crops are an important aspect for maintaining general soil health if used with scientific outlook and proper planning. Several cover crops choices are available. Annual and perennial legumes, various clovers and sweet clovers, bird's-foot trefoil, hairy vetch, common vetch, cicer milkvetch, sainfoin (*Fig. 5*), fenugreek, fava beans, soybeans, field pea or forage pea, cowpea, chickpea, green pea, black pea, different species of beans, oil crops such as annual and perennial sunflower, safflower, flax, forage canola, different mustard species (*Fig. 6*), brassicas such as forage rape, turnips, collards, radish, forage crops such as tef grass, Sudan grass, sorghum, sorghum x Sudan grass hybrids, corn, cereals such as winter rye, wheat and triticale, different millets, such as Proso millet, Japanese millet, German millet, red millet, special or novelty crops such as hemp (*Fig 7*) , chicory, plantain, phacelia, buckwheat, and quinoa are only a handful of choices to mention from a big basket of abundant crop species currently available across Canada.

Several grass species such as orchard grass, tall fescue, short fescue, meadow fescue, creeping fescue, chewing fescue, festulolium, timothy, annual and perennial rye grass, Italian rye grass, and various other forage and native species are being used in specific legume-grass mix, in highly

planned and organized crop rotations or in soil reclamation and pollinator mixes for attracting insect pollinators to the crop fields and in checking soil erosion effectively.
Cover crops should be selected based on the agro-climatic zone and soil zones of the region and used in planned rotations. Species or different appropriate cover crop mixes are to be selected based on the long-term objective of the crop production. For example, cover crop mixes used as pollinator mixes could not only be planted in the field during a fallow; but can also be used in agronomically unsuitable areas, along field perimeter, under the centre pivot stand, hard to access areas of the farm, shelter belts or adjacent to water bodies or low spots in the field too.

Forage cover crops could be used where the field is partly subjected to animal foraging or grazing or ranching. Similarly, oil crops, pharmaceutical or neutraceutical crops, or specialty or novelty cover crops could be used in crop rotations with major food or industrial crops grown in the particular field in a specific agro-climatic region.

Cover crops not only play an important role in crop rotation cycle; but, also help in retaining soil temperature and moisture as well as protect top soil from erosive forces like wind and water. The presence of live roots in the soil and a rich diversity of crops stimulate the growth and population dynamics of important soil mega and micro fauna and flora for sustaining long term soil health, soil quality and soil conservation. Cover crops help in balancing the use of essential soil macro and micro nutrients in the soil, as well as promoting better aeration, hydration, nitrogen fixation, and recycling of essential crop minerals, assisting bumper production of food or cash crops due to improvement in soil quality for successive high-quality crop production.

It is important for all of us to understand and appreciate that soil is a non-renewable resource and needs special care and attention. Unless we are careful to use this special resource so deeply associated with our agricultural and forestry operations judiciously, we may be slowly jeopardizing crop productivity—and our common future—in the not so distant future.

Proper planning and scientific soil management practices can play a vital role in keeping our soil productive as well as healthy. Use of crop rotations and cover crops are some of the important approaches towards long-term soil health, soil conservation, and crop productivity. We need to learn more about our local soil resources for our future food security and incorporate more soil friendly practices to prolong the life and quality of our soil.

Saikat Kumar Basu has a Masters in Plant Sciences and Agricultural Studies. He loves writing, traveling, and photography during his leisure and is passionate about nature and conservation

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CLIMATE CHANGE

Are We on the Brink of an Ecological Armageddon?

Dry ground in the Sonoran Desert, Sonora,Mexico. Credit: Tomas Castelazo (CC)

By Marjorie Harris BSc, IOIA V.O.

The United Nations' 2005 Millennium Ecosystem Assessment Report identified that "biodiversity is an essential prerequisite for the maintenance of ecosystem services providing manifold benefits to human well-being."

How is Climate Change Impacting the Biodiversity of our Planet's Ecosystem?

Regional climate change hot spots have begun to undergo dramatic biodiversity reductions and, in some cases, ecosystem collapse due to temperature related food chain disruptions. Scientists in the field of phenology, the study of cyclic and seasonal natural phenomena relating to climate, plant, and animal life have found that rapid climate change is causing a decoupling of once synchronized light-sensitive cycles from temperature-sensitive cycles.

Slower shifts in climate over geological time frames are well recognized natural and cyclic phenomena. Climate studies have demonstrated that a climate shift 6,000 years ago in northern Africa converted the Sahara grassland savannahs to desert sands. Archeological evidence has found cave paintings in the desert showing mermaids and swimmers in the now-dry local lakes.

How Can We Know that Human Activities are Actually Contributing to an Increase in Global Temperatures?

As the Industrial Revolution was being propelled forward by the burning of fossil fuels, the Greenhouse Effect began building as those fossil fuels released greenhouse gases. The Industrial Revolution began in the 1760's in Europe and had rooted in North America by the 1820's.

BCCOP Book 2; Section 7 Environmental Protection-Guidance

"Organic farmers, and others in the trade, have a commitment to environmental protection. This is a basic principle of the organic movement and must be respected before all other considerations."

Atmospheric carbon dioxide concentrations have risen by 39 percent and methane levels have risen to the highest concentrations in at least 650,000 years. These greenhouse gases prevent thermal radiation from leaving the Earth's surface atmosphere with the ocean acting as a heat sink. The upper ocean layer's heat content has increased significantly more in recent decades. As the ocean absorbs heat, waves, tides, and currents, move that heat from warmer to cooler latitudes, and to deeper levels. Eventually this heat energy re-enters the land systems by melting ice shelves, evaporated water (rain), or by directly reheating the atmosphere. Heat energy stored in the ocean has a long life span—it can warm the planet for decades after it was absorbed.

Early oceanographers recorded ocean temperature data from 1872 to 1876 aboard the HMS Challenger. The ship sailed 69,000 nautical miles, recording 300 ocean temperature profiles at several depths. Fast forward to today's Argo Project headed up by oceanographer Dr. Dean Roemmich. The Argo Project uses 3,000 free-drifting floats for long-term monitoring of global ocean temperatures and salinity every 10 days. In a recent scientific paper Dr. Roemmich reported the results, comparing today's ocean temperatures to those taken by HMS Challenger's crew. The study revealed an overall average temperature increase of 1.1 degrees Fahrenheit (0.59 degrees Celsius) at the ocean's surface over the past 135 years.

Rising Ocean Surface Temperatures Directly Influence Global Weather Patterns

NASA scientists have developed computer simulations of historical weather data. These data described the ocean temperatures that created the weather conditions leading to the North American Dust Bowl from 1931 to 1939, considered to be the most significant meteorological event of the 20th century. NASA scientists found that the Atlantic Ocean surface temperature had risen by 1 degree Farenheit, and that the Pacific Ocean had experienced a cooling La Niña cycle. The combination triggered the drought weather patterns for the America Plains.

The Dust Bowl eroded 100 million acres into stripped and lacerated wastelands spanning Nebraska, Kansas, Colorado, Oklahoma, Texas, and New Mexico, with dust storms severely affecting a total of 27 states. Farms in the Dust Bowl lost an average of 480 tons of topsoil per acre. By 1940, the Dust Bowl conditions had prompted the relocation of 2.5 million people. The infamous Black Sunday storm on April 14, 1935 measured 200 miles across by 2,000 feet high with winds at 65 mph. The dust blocked the sunlight causing temperatures to drop 25 degrees Farenheit in one hour. During one severe two-hour period on Black Sunday, the violent storm stripped away twice as much soil as had been dug out over seven years to build the Panama Canal.

Hugh Hammond Bennett became known as the father of soil conservation in his work as founder and head of the US Soil Conservation Service. Bennett identified poor farming practices, deep plowing, denuded soil, removal of trees, and drought as the main causes of the Dust Bowl.

Under Bennett's leadership, the US Soil Conservation Service initiated a 30-year program to restore and mitigate the damages of the Dust Bowl, including the replanting of denuded land. Bennett also set up programs to teach farmers better land management techniques such as leaving crop stubble in the field after harvest. Additionally, in the 1930's, the US government purchased 11.3 million acres and replanted native grasslands. However, damage to the land was so severe, that by the year 2,000 some areas were still barren of growth and blowing dust.

Light and Temperature-Sensitive Ecosystem Cycles

Bennet stated, "the Kingdom of Nature is not a democracy; we cannot repeal natural laws when they become irksome. We have got to learn to conform to those laws or suffer severer consequences than we have already brought upon ourselves."[5]

Here we are some 80 years after Bennett's warning, and status updates report that climate change is moving forward unabated. An important factor in climate change is the disruption of ecosystem relationships by decoupling synchronized light-sensitive cycles from temperature-sensitive cycles.

Farmers are familiar with counting heat units to time the application of pest controls. This is because many insects—as well as reptiles, and amphibians—use temperature-sensitive cycles as cues for hatching emergence. Sex selection for some reptiles, such as crocodiles, is temperature based—the temperature of incubation will determine the sex of the offspring. This leaves many reptiles at-risk: an entire sex can be removed from the reproductive landscape in a few breeding seasons.

Continued on the bottom of page 27...

farm story:
The Biodynamic Ice Break

Full Moon. Credit: (CC) Diego Torres Silvestre

By Anna Helmer

Would you mind if we talked about Biodynamic farming?

There. That's how you keep your readership small. Those of you still with me have fought through eye-glaze and eye-roll and have resisted page turn. You will notice that even I am struggling a bit to stay on topic, and if only you could see the amount of squirming and fidgeting I am doing as I try to find the right way to write about one of the more under-simplified and over-complicated farming methods of our time.

There is no way around this fact: Biodynamic farming methods involve focusing the power and influence of the entire universe on the health and productivity of the soil, plant, farmer, and consumer. The sun, the planets, the galaxies beyond ours: they all matter. The position of the moon matters. It's complicated. It's off-putting.

And yet, quite simply, it works whether you understand why or not. In fact, the less time sorting that out, the more time there will be for actual work and that is what really matters.

We do need to talk about it, though. Biodynamics is an approach to farming that combines science, philosophy and common sense and it should not be avoided. Something like this could easily become the future of farming.

You should know that it is a popular farming method in Germany, which has the highest concentration of scientific-minded farmers in the world, a fact I completely fabricated but which I believe could be used for emphasis without harm. I have (in actual fact) heard German farmers speak in excruciating scientific detail about soil science and crop management and then mention in a self-consciously off-hand manner that they also use Biodynamic preparations. Pressed further, they become extremely and remarkably vague about the details. I find this fascinating: farmers like that would not waste their time with something that wasn't working.

Our farm has been Biodynamic in practice and often certificate since the mid-nineties when my parents attended a conference on the subject and were impressed with the practical experience of the speakers. We have slowly incorporated some methods into our farming practices—and avoided talking about it as we really don't understand it well enough to explain.

To be honest, I have not been paying much attention to the whole thing, content to let my parents and sister tell me what to do. It seemed more important to learn things

like welding, mechanics, and fertility-building cover crop management. Although I have certainly not mastered any of that, I have gradually pushed Biodynamics up higher on the “things-to-learn-that-will-probably-be-helpful” list. Some Biodynamic practices have been incorporated thoroughly into our farm routine. Mom’s Biodynamic compost heaps, for example, could probably turn old cars into nice, rich, loamy soil. Tree branches certainly presented no difficulty. I follow her directions to build the heap, and I add the preparations (yarrow, chamomile, nettle, oak bark, dandelion, valerian) and marvel at the result a few months hence. It seems like magic, but really it isn’t.

My sister annually buries cow horns stuffed with manure and that becomes the preparation we apply to the carrot field every year. It’s very simple: if we do it, we get great carrots. If we don’t, they are normal.

My mom boils it all down quite nicely: it is a fun way to farm.

Our Biodynamic practice does not extend far beyond this. It really should, or at least could. It is time to experiment with a few more methods, acquire some knowledge, become conversant. Most of all, I want to write about it in a way that can be easily understood. Is that possible? Can we keep it fun?

I am starting at a very, very basic level of celestial understanding. This point cannot be over-emphasized. I cannot even tell you for certain what my birth sign of the zodiac is. I just never found it important. In terms of blind faith however, I am on more solid ground. I can “witch” water wells, for example, and fully support the protection of random wild areas on our farm because grandma said there were a lot of fairies living there. I guess the fact that I now believe with absolute certainty that it is quite likely that plant health is influenced not only by the phases and position of the moon but the universe beyond isn’t such a stretch after all. You commoners will have to struggle to keep up.

My first self-assigned task has been to read the original lectures, delivered in 1924 at a German agricultural convention by Rudolph Steiner, a philosopher with a practical bent who is also known for starting the Waldorf school system. This I am doing until the snow melts and I don’t have time for reading anymore. Looks like I might be able to make it through the whole works.

Contained in a book called Agriculture, the lectures were commissioned by a group of farmers who had recently begun to use chemical fertilizers. Although the yields of certain cash crops were reaching unheard-of levels, they noted a significant decline in the health of their soils, and the overall productivity of their farms. Alarmingly, they could no longer produce very much at all without the use of the new chemicals.

So far, for about 95% of what I have read, I have not a clue what he is talking about. Every once in a while, however, he talks about potatoes, and I certainly know what they are. They are the hook that keeps me focused. I keep reading, hoping he will mention them again.

Another point of light is his reasoning for considering the universe in the first place. You can’t describe a person based on the last joint of their little finger, nor describe a farm using one plant in the far corner, but they are strongly related to the whole. If we allow for the possibility that we are the little joint of the little finger of the universe, if becomes obvious that there is a lot going on that matters to us.

We are part of something much bigger.

Stay tuned for the next exciting installment. I am going to be building compost heaps and seeding celeriac at a time suggested by the Biodynamic Calendar: the sun will be in Pisces and the moon in Virgo. I don’t know what this means but hopefully the plants can sort it out.

Anna Helmer farms potatoes in the Pemberton Valley with her family and friends who know she can cook if she must.

HEALTHY SOILS
YIELD RESILIENT OPERATIONS

Farm field in Delta, BC. Credit: CAI - Emrys Miller

Three case studies examine soil management practices in the face of climate change

By Rachel Penner, BC Agriculture & Food Climate Action Initiative

Improving soil health is one way producers can increase the resilience of their operations in the face of climate change. The BC Agriculture & Food Climate Action Initiative (CAI) has supported multiple projects, with funding from the provincial and federal governments, evaluating practices to maintain or improve soil health. Case studies in three regions of the province offer some practical takeaways for farmers looking to adapt to changes in climate.

Okanagan: Adding Compost and Reducing Irrigation

Climate change is expected to increase average temperatures and lengthen the growing season in BC's Interior, enabling cherry producers to expand production northward and grow crops at higher elevations. However, expanding production may be limited by challenges with managing soil pathogens and by water availability.

A three-year research project focusing on cherry production in the Okanagan resulted in two key findings:

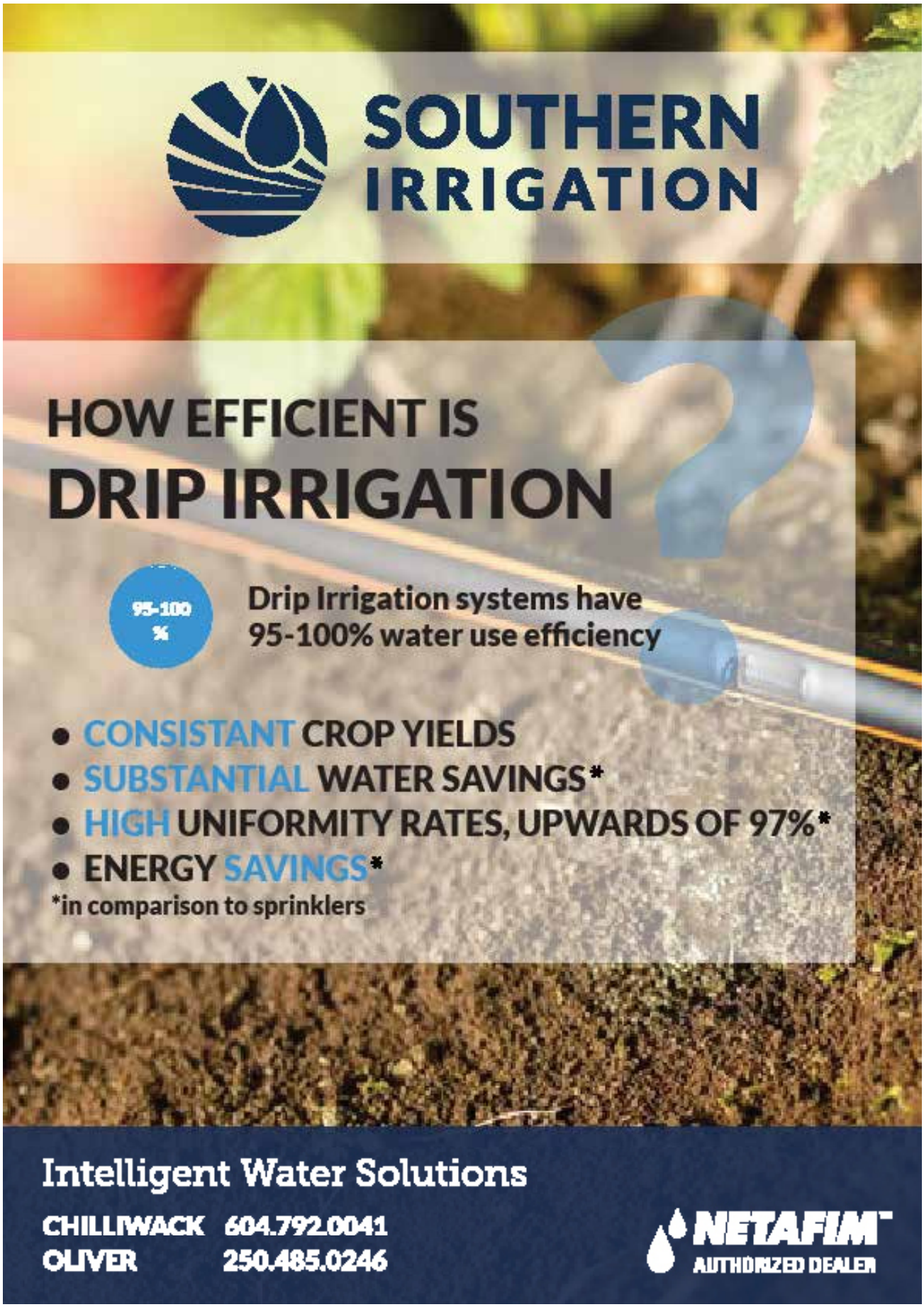
- adding compost to old and new orchards helped maintain soil health
- reducing post-harvest irrigation by 25% did not impact fruit yield or quality

Gayle Krahn, the horticulture manager at Coral Beach Farms, participated in the project. "It's through these trials that growers gain the confidence needed to invest in mulches," says Krahn. "As well, the results from the deficit irrigation studies gave us a good handle on how much water we need in our orchards. Climate change could affect our water supply, so we need to be mindful of our water usage while ensuring we can continue to grow healthy crops."

Louise Nelson with the Biology department at UBC Okanagan led the three-year experiment. Researchers monitored the effects of compost and mulch applications, comparing results with controls in two new and one established orchard, and assessed the impacts of post-harvest deficit-irrigation.

The study, completed in 2018, revealed that adding compost to cherry orchards had the following impacts on the soil:

- increased soil organic matter, total carbon and nitrogen, other mineral nutrients and pH


SOUTHERN
IRRIGATION
HOW EFFICIENT IS
DRIP IRRIGATION
95-100 %
Drip Irrigation systems have
95-100% water use efficiency
• CONSISTANT CROP YIELDS
• SUBSTANTIAL WATER SAVINGS*
• HIGH UNIFORMITY RATES, UPWARDS OF 97%*
• ENERGY SAVINGS*
*in comparison to sprinklers
Intelligent Water Solutions
CHILLIWACK 604.792.0041
OLIVER 250.485.0246
NETAFIM
AUTHORIZED DEALER

- increased percentages of nitrogen, phosphorus and potassium in leaves after two years
- increased fruit firmness and stem pull
- tended to increase total nematode abundance in soil
- tended to decrease plant parasitic nematodes in plant roots and soil
- decreased colonization of roots by arbuscular mycorrhizal fungi

"I would definitely recommend that growers invest in compost as it helps build soil structure, reduce moisture loss and keep soils cool during summer heat," says Krahn. "The result is increased root growth and a healthier tree, which equates to growing quality fruit."

The study also found that a 25% reduction in post-harvest irrigation had no impact on fruit yield and quality, stem water potential, tree growth, or leaf mineral content, giving producers greater assurance that they can safely decrease water usage in their cherry orchards post-harvest.

Delta: Using and Maintaining Tile Drains

Climate projections indicate that winter rainfall will increase and extreme rainfall events will double in frequency by the 2050s in BC's Fraser River delta. This increase in moisture could prevent farmers from getting onto waterlogged fields, either to plant or to harvest, and could also increase soil erosion, nutrient runoff, and damage to crops. However, effective spacing and maintenance of tile drains can increase the ability of producers to work their fields.

A project in Delta, completed in July 2017, evaluated practices for improving on-farm drainage management as a way to adapt to wetter spring and fall conditions. The project, led by three researchers in the Faculty of Land & Food Systems at UBC in collaboration with the Delta Farmers' Institute, the Delta Farmland & Wildlife Trust and local farmers, set up demonstration sites on two fields and monitored practices across a total of 30 fields in multiple locations.

- The results of the two-year project indicated the following:
- Using tile drains in vegetable crop fields increased workable days by 8% and by 14% when pumps where also used. (The impact was negligible for blueberry fields.)
- Drain tiles spaced at 15 feet allowed soil to dry faster in the spring than drain tiles spaced at 30 feet.
- Cleaning tile drains resulted in 12 extra workable days per year at a cleaning cost of $10/additional workable day/acre.

Central Interior: Practising Management-intensive Grazing

Management-intensive grazing, a practice that involves planned grazing and rest periods for pastures, is a context-dependent practice that can vary from one rancher and pasture location to the next, making it difficult to test the impact it has on soil.

A four-year project in BC's Central Interior, completed in spring 2017, compared grazing practices and used traditional soil sampling methods, plant community composition and remote sensing to measure soil carbon. Results confirmed that management-intensive grazing increased soil carbon, which has important implications for soil health.

"What got me interested in grazing-management practices was the enthusiasm of the ranching community," says Lauchlan Fraser, a professor at Thompson Rivers University who led the project. "I wanted to see if some of the claims that were being made held up."

The data showed that, for intensively managed pastures, total carbon was 28% greater and organic carbon was 13% greater when compared to extensively managed pastures. It is widely agreed that this stored carbon is linked to soil health, and a fact sheet for the study stated that: "Benefits associated with greater soil carbon include soil moisture retention, erosion control and species biodiversity."

These outcomes were experienced by the producers who participated in the study. All the ranchers reported that they saw improved soil moisture retention, which would help them cope better in a drought year. They also thought the practice would work as a tool to control invasive species and improve plant and animal diversity, both important contributors to resilient grazing systems.

"It would be worthwhile to follow up with doing the research required to test how biodiversity and soil moisture are influenced," says Fraser.

While carbon sequestration is primarily associated with climate change mitigation, the project's final report found additional implications for climate change adaptation: "Flexibility of electric fencing, and actively managing cattle on a daily basis, was identified to be an adaptation strategy, since a rancher is able to adapt his or her practices based on conditions which vary from one year to the next," says Fraser.

Project Funding and Detailed Reports
For all three of the projects, funding was provided by the

Governments of Canada and British Columbia through the Canadian Agricultural Program as part of the Farm Adaptation Innovator Program delivered by CAI.

Complete project results and fact sheets can be found on the CAI website at:

bcagclimateaction.ca

Rachel Penner is the Communications Specialist for the BC Agriculture & Food Climate Action Initiative. She grew up on a grain farm in southwestern Manitoba, received her journalism diploma in Alberta and spent time as a writer and editor in Saskatchewan. She now resides in Victoria, BC, where she works and volunteers as a communications designer and strategist.

...Footnotes from the Field—continued from page 21

Phytoplankton communities are losing biodiversity in the face of higher ocean temperatures as natural selection is for more heat-tolerant groups. Phytoplankton make up only 0.2 percent of global primary producer biomass, yet they are responsible for about 50 percent of the world's primary food production. In addition, phytoplankton are key components in the global carbon cycle. Reduction in the biodiversity of phytoplankton communities changes the primary producer profiles and reduces the resilience of the ocean ecosystem.

The concept of an Ecological Armageddon is emerging — Dr. CA Hallmann reports an 82 percent decline in flying insects at 63 protected sites in Germany, over a 27-year study period. Hallmann notes, "loss of insects is certain to have adverse effects on ecosystem functioning, as insects play a central role in a variety of processes, including pollination, herbivory and detrivory, nutrient cycling, and providing a food source for higher trophic levels such as birds, mammals, and amphibians. For example, 80 percent of wild plants are estimated to depend on insects for pollination, while 60 percent of birds rely on insects as a food source." In Puerto Rico's Luquillo rainforest, researcher Bradford C. Lister found that biomass loss increased from 10 to 60 times over the 30-year study period. Lister's analysis revealed a synchronous decline in lizards, frogs, and birds that eat insects. Lister determined that the forest temperature had risen 2.0 degrees Celcius over the study period—a temperature change that prevented insect eggs from hatching, and reducing food supply for animals higher up the food chain.

Light-sensitive activities for mammals and birds include migration, breeding, and predation. As well, some plants are reliant on light-sensitive cues for growth stimulation. For example, caribou populations in the Artic are in decline due to the decoupling of temperature and light-sensitive cycles. Pregnant caribou migrate to birthing grounds based on light cues to time their arrival with the emergence of nutrient-rich plant growth. However, due to rising artic temperatures, the plants are germinating earlier. When the pregnant caribou arrive to their feeding grounds, plant nutrition has already decreased—resulting in malnourished caribou mothers producing fewer calves. Another light-sensitive lifecycle example is the change in the Arctic mosquito cycle. Migrating birds rely on the larval Arctic mosquitos as a rich food source, but the mosquitos are hatching earlier under warmer temperatures. When birds arrive, the mosquitos are in their adult form, and the birds are without a source of food. The now unchecked mosquito population impacts the caribou lifecycle when caribou calves are predated to death by unusually gigantic swarms of blood-sucking adult mosquitos.

The butterfly effects of climate change on the intricacies of the planetary food web are only just emerging. Hopefully, we can adapt before an Ecological Armageddon occurs.

Marjorie Harris (BSc, IOIA VO) is an organophyte, consultant, and verification officer in BC. She offers organic nutrient consulting and verification services supporting natural systems.

References:

Roemmich, D, Gould WJ, Gilson J. 2012. 135 years of global ocean warming between the Challenger expedition and the Argo Programme. Nature Climate Change. 2:425-428. 10.1038/nclimate1461

NASA Explains the Dust Bowl Drought: nasa.gov/centers/goddard/news/topstory/2004/0319dustbowl.html

Handy Dandy Dust Bowl Facts: kinsleylibrary.info/wp-content/uploads/2014/10/Handi-facts.pdf

The Dust Bowl: u-s-history.com/pages/h1583.html

The Dust Bowl, an illustrated history, Duncan & Burns, 2012 (pages 160 - 162)

Climate Change: Ocean Heat Content: climate.gov/news-features/understanding-climate/climate-change-ocean-heat-content

Temperature and species richness effects in phytoplankton communities. ncbi.nlm.nih.gov/pmc/articles/PMC3548109/

Lister, B.C. Department of Biological Sciences, Rensselaer Polytechnic University, Troy, NY 12180 pnas.org/content/115/44/E10397.short

More than 75 percent decline over 27 years in total flying insect biomass in protected areas: journals.plos.org/plosone/article?id=10.1371/journal.pone.0185809

The Millennium Ecosystem Assessment 2005: was called for by United Nations Secretary-General Kofi Annan in 2000 in his report to the UN General Assembly, We the Peoples: The Role of the United Nations in the 21st Century.

... Soil Testing, continued from page 7

cator of salt content to avoid exacerbating this pre-existing situation.

From a broad nutrient management perspective, testing for C:N, nitrogen (N), and phosphorous (P) are valuable first steps in balancing these nutrients, as compost products are often used to supply all or at least part of the N and P needs in organic farming systems. Additionally, these nutrients are important to consider because they are not only needed in significant quantities, but are also environmentally damaging when lost to surrounding ecosystems. In general, applying compost to target crop N requirements results in the over-application of P, and over time we see excess P levels in soils where this management practice is common (Sullivan & Poon, 2012). This highlights the advantage of implementing soil and compost testing, where we can not only monitor our soil P levels over time, but also be aware of the quantity we are applying by testing our amendments.

Finally, while N and P are two important plant macronutrients, compost provides a variety of other plant nutrients that can be important considerations, depending on the crop we are amending, soil test values, and any other farm-specific considerations. Implementing compost testing as a tool to be more informed about the properties of these amendments allows for more specific, targeted use and more efficient, environmentally-friendly farming systems overall.

How to Calculate Amendment Needs

While compost and soil tests answer the question "What's there?", there are still a few steps to go from these values to a target amendment application rate in the field. This can often be the most intimidating element and involves a few calculations. However, there are several online or downloadable calculators and resources for this process. The two nutrient calculators listed below are good starting points, and are accompanied by several resource pages and/or documents to get oriented to how they work. The BC Ministry of Agriculture's Nutrient Management Calculator allows you to pick your lab when inputting your values, and will assist you in choosing the right rate and nutrient source for your crops.

Amendment Calculators:

Organic Cover Crop and Fertilizer Calculator (OSU Extension):

extension.oregonstate.edu/organic-fertilizer-cover-crop-calculators

BC Ministry of Agriculture Nutrient Management Calculator

gov.bc.ca/gov/content/industry/agriculture-seafood/agricultural-land-and-environment/soil-nutrients/nutrient-management/nutrient-management-calculator

Additional Nutrient Management Resources:

Fertilizing with Manure and Other Organic Amendments (PNW):

catalog.extension.oregonstate.edu/pnw533

Nutrient Management for Sustainable Vegetable Cropping Systems in Western Oregon (OSU):

catalog.extension.oregonstate.edu/em9165

Soil Fertility in Organic Systems – A guide for gardeners and small acreage farmers (PNW):

catalog.extension.oregonstate.edu/pnw646

Post-harvest Nitrate Testing

The post-harvest nitrate test (PHNT) is a soil test performed in the late-summer to early-fall to evaluate nitrogen (N) management, and is another soil test to add to your nutrient management toolkit. This test measures the amount of nitrate-N remaining in the soil following harvest, and represents the plant-available N that was not used by the crop during the growing season.

Nitrate is highly mobile within the soil system and so is highly susceptible to leaching during winter months. For example, in coastal BC, effectively all soil nitrate is assumed to be lost from the root zone (in absence of an established cover crop) due to high winter rainfall. As such, it is:

1. common for spring nitrate-N soil test values to be minimally informative, and
2. important to manage soil N in ways that keep PHNT values low.

The PHNT is often referred to as a "report card" assessment of N management as it is used in retrospect—an evaluation of the impacts of nutrient management decisions that were made for the previous season. It provides a way for growers to assess and adjust their N management, to both get the most effective use out of the fertilizer inputs they are paying for, and to reduce environmental impacts of excess nitrates entering waterways.

To take a sample for PHNT, follow the general instructions for a taking a soil sample (see above in 'Best Practices for Taking a Soil Sample'), plus the following modifications. Note that PHNT sampling protocols are somewhat crop and region specific. The following are generalized tips:

- **Timing:** the general guideline is to sample after harvest, and before cover crop seeding, soil amending, and significant rainfall. For example, sampling before 125mm cumulative rainfall in south coastal BC on fine to medium textured soils is ideal.
- **Depth:** sample to a minimum of 30cm. This is deeper than standard nutrient sampling recommendations.
- **Adjust for volume** take the nitrate-N value that you get from the soil lab and multiply by depth (0.3m),

Table 1. *Post-Harvest Nitrate Test (PHNT) ratings developed for corn and grass in the B.C. Lower Mainland (taken from Kowalenko et al. 2007).*

Rating	**General Interpretation**	**PHNT (kg/ha) 0-30 cm**
Low	Continue present N management	< 50
Medium	Adjust N management to improve plant uptake efficiency	50-99
High	Reduce N inputs, implement strategy to reduce N leaching (e.g. cover crop)	100-199
Very High		>200

multiply by the bulk density of the soil (kg/m^3), and divide by 100 to get PHNT value in kg/ha. Soil bulk density will vary by soil type, and farm-specific values can be attained by paying for a bulk density test at a soil lab. The finer the texture, the denser the soil - many commonly used book-values fall between 1150 to 1300 kg/m^3.

For certain forage crops in coastal BC, such as silage corn and grass, target PHNT values have been developed to indicate whether N inputs should be managed differently in the following season. Under these rating systems (Table 1), higher ratings mean lower N-use efficiency and greater risk for leaching loss of nitrate-N.

The typical, potential reasons for inefficient N-uptake are:

- N applications were in excess of total crop needs;
- N was not applied at the optimal time(s) for crop uptake; or,
- N was not applied where it was accessible to plant roots, or that other growing conditions (e.g. moisture, temperature, other nutrients) were limiting to crop uptake of N.

Relative differences in PHNT values are a useful tool in N management decisions, regardless of crop-specific target PHNT values. If you can identify a field or crop with high PHNT relative to your other fields, this is something to note, adjust nutrient management, and evaluate how that impacts your PHNT values the following season. This PHNT approach to N testing will provide much more insight into your N management than the N values you will receive from your spring soil tests. To address the need for more PHNT information in other field vegetable crops besides silage corn and grass, work is ongoing in BC to better understand PHNT testing and its implications.

Further detail on taking samples and interpreting PHNT values is available through the OSU Extension Catalog, search 'Post-Harvest Soil Nitrate Testing':

catalog.extension.oregonstate.edu/em8832

Assistance can also be found by contacting your Organics Specialist, Emma Holmes (Emma.Holmes@gov.bc.ca) at the BC Ministry of Agriculture.

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References

Kowalenko, C.G., Schmidt, O., and Hughes-Games, G. (2007). Fraser Valley Soil Nutrient Study 2005. A Survey Of The Nitrogen, Phosphorus And Potassium Contents Of Lower Fraser Valley Agricultural Soils In Relation To Environmental And Agronomic Concerns.

Sullivan, C. S., & Poon, D. (2012). Fraser Valley Soil Nutrient Survey 2012.

...Crop-Livestock Integration continued from page 13

the pages of this magazine, Corine Singfield[7] and Tristan Banwell[8] are both carrying out promising on-farm research focusing on livestock integration and MIG. Stay tuned for more details!

DeLisa has two decades of experience managing certified organic mixed vegetable production systems. She was lead instructor for the UBC Farm Practicum in Sustainable Agriculture from 2011-2014, and her teaching, research, and consulting continue with focus areas in soil nutrient management, farm planning, and new farmer training. Her volunteer service to the community of growers in British Columbia includes membership on the COABC Accreditation Board and North Cowichan Agriculture Advisory Committee.

Footnotes

[1]Examples of long-term agricultural research include > 100 years at Rothamstead in the U.K., Morrow plots and Sanborn Field (USA), > 40 years at the Rodale Farming Systems trial

[2]See the 'science of soil health' video series published by the USDA NRCS, 2014

[3]See the BC Soil SIFT tool for mapped and digitized information on your soil types and agricultural capability

[4]Conservation tillage is recognized as a 'climate friendly' and soil health promoting practice, and there are many variations on that theme as farmers and farming systems. I use the term 'careful' tillage to emphasize attention to monitoring soil moisture conditions to reduce soil physical and biological impacts, and as an overall effort to reduce the number of passes with machinery. Not to be missed, in a discussion of soil health and climate friendly farming practices, are two recently published growers focused books on the no-till revolution in organic and ecologically focused farming systems. See what Andrew Mefford and Gabe Brown have to say in the recent issue of 'Growing for Market' magazine.

[5]Management Intensive Grazing defined as emphasizing 'the manager's understanding of the plant-soil-animal-climate interface as the basis for management decision' in Dobb, 2013 is a promising, climate friendly practice for BC growers. I use the term 'modified' to signal that I have not yet achieved the daily moves or high intensity stocking numbers often associated with MIG. Our paddock rotations have evolved to reflect our immediate needs for lower labour inputs and less frequent moving of the animals with their paddocks.

[6]See Erik Lehnhoff and his colleagues' (2017) work in Montana for an interesting review of livestock integration and organic no-till in arid systems.

[7]See Corine Singfield's article on integrating pigs and chickens into crop rotations in the Winter 2016 issue of the BC Organic Grower.

[8]See Tristan Banwell's article on Managed-intensive grazing in the Winter 2018 issue of the BC Organic Grower.

References

Badgery, W., et al. (2017). Better management of intensive rotational grazing systems maintains pastures and improves animal performance. Crop and Pasture Science.68: 1131-1140. dx.doi.org/10.1071/CP16396

Bunemann, E.K., et al. (2018). Soil quality - a critical review. Soil Biology and Biochemistry. 120:105-125. doi.org/10.1016/j.soilbio.2018.01.030

Cunfer, G. (2004). Manure Matters on the Great Plains Frontier. Journal of Interdisciplinary History. 34: 4 (539-567).

Dobb, A. (2013). BC Farm Practices and Climate Change Adaptation: Management-intensive grazing. BC Agriculture and Food Climate Action Initiative. deslibris-ca.ezproxy.library.ubc.ca/ID/244548

Lehnhoff, E., et al. (2017). Organic agriculture and the quest for the holy grail in water-limited ecosystems: Managing weeds and reducing tillage intensity. Agriculture. 7:33. doi:10.3390/agriculture7040033

Pan, W.L., et al. (2017). Integrating historic agronomic and policy lessons with new technologies to drive farmer decisions for farm and climate: The case of inland Pacific Northwestern U.S. Frontiers in Environmental Science. 5:76. doi:10.3389/fenvs.2017.00076

Richards, M.B., Wollenberg, E. and D. van Vuuren. (2018). National contributions to climate change mitigation from agriculture: Allocating a global target, Climate Policy. 18:10, 1271-1285, doi:10.1080/14693062.2018.1430018

Telford, L. and A. Macey. (2000). Organic Livestock Handbook. Ontario: Canadian Organic Growers.

Worster, D. (2004). Dust Bowl: The southern Plains in the 1930s. New York: Oxford University Press.

Province of British Columbia, Environment, M. O. (2018, May 09). BC Soil Information Finder Tool. gov.bc.ca/gov/content/environment/air-land-water/land/soil/soil-information-finder

Explore the Science of Soil Health. (2014). USDA National Resources Conservation Service. nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/health/?cid=stelprdb1245890

Singfield, C. (2016). Integrating Livestock into Farm Rotations. BC Organic Grower. bcorganicgrower.ca/2016/01/integrating-livestock-in-the-farm-rotations/

Banwell, T., Tsutsumi, M. (2018). Organic Stories: Spray Creek Ranch. BC Organic Grower. bcorganicgrower.ca/2018/01/organic-stories-spray-creek-ranch/

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