BC Fruit Growers' Association

Agriculture Climate Solutions – Living Lab Workshop Summary-January 4, 2023

Coast Capri Hotel-Kelowna

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada
IAF Investment Agriculture Foundation
Canada

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"Agriculture and Agri-Food Canada and the Investment Agriculture Foundation of BC are pleased to participate in the delivery of this workshop. We are committed to working with our industry partners to address issues of importance to the agriculture and agri-food industry in British Columbia. Opinions expressed in this report are those of the authors and not necessarily those of the Investment Agriculture Foundation or Agriculture and Agri-Food Canada.

Agricultural Climate Solutions – Living Labs (ACS-LL), is a Government of Canada 10-year program that will establish a Canada-wide network of living labs. Through these living labs, regional leaders will bring together farmers, scientists, and other sector partners to co-develop, test and monitor beneficial management practices on working farms to reduce Canada's environmental footprint and enhance climate resiliency. (downloaded from https://agriculture.canada.ca/en/environment/climate-solutions)

On January 4, 2023, the BCFGA held a workshop in Kelowna for Okanagan tree fruit growers and Living Lab partners, including Agriculture and Agri-Food Canada (AAFC), BC Ministry of Agriculture and Food (BCMAF), BC Investment Agriculture Foundation (IAFBC), UBC Okanagan (UBC), BC Agricultural Climate Action Research Network (ACARN) and the BC Wine Grape Council (BCWGC).

AAFC and UBCO speakers presented ACS-LL background information and overviews of research relevant to LL projects. The LLs will take innovative methods from laboratory and research station studies and adapt these methods to growers' lands. Growers are also encouraged to include their own innovations.

The researchers will monitor and measure carbon and nitrogen levels in the soil, air and plants. A number of variables will be studied but some data collected may also include fruit quality and fruit quantity, resource requirements (e.g., water, labour, seed, and soil amendments), microbial populations, and weather. UBCO graduate students and AAFC scientists will interpret the findings and share the knowledge with the BC tree fruit community as Best or Beneficial Management Practises (BMPs).

Growers provided feedback and suggestions for areas of study, as summarized below:

1. Logistics – geographic location of sites, size of plots, resource requirements, irrigation type and scheduling, crop, age of planting

2. Commitment – length of time study requires, size of plot, grower involvement (labour, resources)

3. Methodology – BMP criteria, e.g., cover crop plants

4. Contribution – in-kind and cash required from growers

5. Risk – weather (drought and water allocations), pests, crop

Researchers provided the following comments:

1. Locate research sites at orchards that minimize travel time for researchers (preferred locations Penticton to Kelowna)

2. A main research site (three in the Okanagan) and up to 8 satellite sites can be used so more intensive monitoring can be accomplished at a main site

3. The number of plots required increases with the number of treatments.

4. Measurements are taken over many seasons and changing a practise can change the outcome of the project.

Recommended Best or Beneficial Management Practise for the ACS-LL:

Vegetative Ground Covers in Tree Fruit Orchards – alley (drive-row) and in-row

Research Project Deliverables

1. baselines for C and N in soils, orchards (trees and crop), air
2. measurements crop inputs (including C, N, water, labour)
3. measurements of orchard outputs (including crop quality and quantity, soil water storage capacity)
4. BMP recommendations for growers
    a. vegetation cover seed mix and rates
    b. vegetation cover establishment and maintenance information (site preparation, seeding, mowing)
    c. vegetation cover selection matrix with cost, availability, crop, vigour, soil, irrigation, weather, life cycle, and location criteria; include pollinator-friendly, bio-fumigants, native plants (weeds), annuals, perennials, N-fixers, drought tolerant, income generating harvestable crops; consider pest management (diseases, insects, nematodes, rodents, ungulates, predators, migratory and resident birds)
5. Site visits and field days
    a. Formal events (hosted at main research sites)
    b. Informal drive by and on-site visits (can be at main sites or satellite sites)
6. Interpretation and extrapolation of findings
    a. Information on how to use project techniques on other farms
    b. Explanation of what the findings mean for farm management purposes (e.g., cost savings, labour savings)
    c. Recommendation of vegetation cover system for BC tree fruit orchards

Following the presentations and some guided discussion the following action items were agreed to by all involved:

Action Items

1. Literature scan for orchard floor drive-row and in-row cover crops. (Researchers)
2. Experimental design for main site and satellite sites (Researchers)
3. Proposal to growers (Researchers)
4. Site selection (Researchers/growers)

5. Field work start up (Growers/researchers/grad students)

From the discussions, presentations and the general input there were some concerns and considerations made known to the group in moving forward. They are summarized below and will help guide site selections and land management.

Considerations

1. Methods – tilling, seeding, establishment, mowing, maintenance
2. Crop diversity – e.g., grass and clover, perennial, annual, winter-annual, spontaneous and already existing vegetation
3. Vegetative cover crop vigour
4. Resource requirements – labour, water -- costs
5. Nitrous Oxide (NO) production
6. Fungi as a cover crop – mushroom production, mycorrhizae
7. measuring equipment use and man hours, pesticide and fertilizer choice and use
8. cross-benefit analysis -- yield and quality included in data set
9. Plot size recommended at minimum 1 acre; variable and complex soils
10. Cost to grower; incentive to grower (make life easier)
11. Plants with herbicide resistance or tolerance and organic production
12. Beneficial insect attraction and pest management
13. Income stream crop and carbon sequestration
14. Cropping options, e.g., lentils and mung bean, equipment and harvesting
15. Main LL site with satellite sites; limit BMPs per site
16. Waste products (apple pumice) re-integrated; composting system; anaerobic digestion, included with vegetation cover best practise
17. Irrigation systems e.g., micro sprinklers interference, water spreading in-ground
18. Non-specific choice of vegetative cover but comparison of alley way (drive-row) versus in-row
19. Study design suitable for a graduate student project where data set is statistically valid
20. Specific contrasts and number of treatments should not be more than the number of replicates e.g. 2-3 treatments need minimum of 2-3 replicates
21. Control groups -- year over year comparison, control is usually what the grower does, grower practise is the control (industry standard), not an untreated control (UTC)
22. Changing practise or discontinuing the trial – can be accommodated but long term goal is emphasized (not immediate benefits) and fluctuations can be expected on a yearly basis; research committee will review results annually
23. Benefits and co-benefits overlap; soil compaction, water infiltration, microbial activity, aeration, root growth, (e.g., radish growth hitting hard pan), under tree cover crop choice shorter or change irrigation system (e.g. hanging micro sprinkler in vineyards), adjustments and trade-offs
24. Innovations – new machinery or old idea modified to new system e.g., roller-crimping and mowing practises (variable swath width and off-set mulching mowers)
25. Crop choices e.g., Brassicas are good for C sequestration, bad for microbe growth

26. Site selection – geographic location, cherry or apple
27. Implementation and applied research project – previous research with standard replicated trials in Washington or NY State; trials on entire farms in large blocks across the landscape has not been done; add to basic knowledge and help with monitoring
28. Costs include seed bed preparation, broadcast seeding or seed drills (broadcasting requires more seed, drawback is spreading seed under trees)
29. Safety of workers and food (i.e. risk of machinery and worker slippage and increased retention of agri-chemicals, human allergens, bin contamination)

APPENDIX A: Agenda

Agricultural Climate Solutions Living Labs Program
Tree Fruit Workshop
Coast Capri Hotel, Kelowna
January 4, 2023

Agenda

Registration/Coffee *9:30 a.m.*	Carl Withler, Greenspark Consulting, and Meeting Chair
Welcome and Introductions *10:00 - 10:05 a.m.*	Deep Brar, BCFGA
Overview of Agricultural Climate Solutions' (ACS) BC Living Lab initiative *10:05 - 10:25 a.m.*	Brenda Gendron, Investment Agriculture Foundation (IAF) Jesse MacDonald, AAFC SuRDC
BC Living Labs - Perennial Row Crops (*Tree fruit, wine grapes, blueberries, raspberries, and hazelnuts*) *10:25 - 10:35 a.m.*	Gail Nelson, BCFGA
Soil carbon pools and nitrous oxide emissions in Okanagan tree fruit: what do we know already? *10:35 - 11:00 a.m.*	Kirsten Hannam, AAFC SuRDC
Overview of management tools to improve soil carbon and reduce N inputs *11:00 - 11:30 a.m.*	Mehdi Sharifi, AAFC SuRDC
Panel and discussion: BMPs Deployment and Assessment of Co-benefits *Q&A* *11:30 - 12:30 a.m.*	Carl Withler (moderator) Hans Buchler, BC Wine Grape Council Miranda Hart, UBC Okanagan Tom Forge, AAFC SuRDC
Lunch **12:30 - 1:30 p.m.**	
Facilitated discussion on the use of cover crops in tree fruits (current practices and potential new crops) *1:30 - 2:15 p.m.*	Carl Withler (facilitator)
Summarizing the day, next steps, meeting feedback form *2:15-2:30 p.m.*	Gail Nelson