Agriculture et Agroalimentaire Canada | Agriculture and Agri-Food Canada

AgriScience Program

2020-2021 Annual Performance Report

Name of Recipient: Organic Federation of Canada	
Project Title: ASC-13 Organic Cluster III: Connecting Environmental Sustainability with the Science of Organic Production	
Project Number: CAP-J-002151 ASC-13 Organic Cluster Activity #5	Period Covered by Report (YYYY-MM-DD to YYYY-MM-DD): 2020-04-01 to 2021-03-31
Activity #: 5 Name of Activity: Organic Oat Breeding / Oat cultivars specifically developed for organic production systems in Canada	Principal Investigator: Kirby Nilsen
Activity Start Date (YYYY-MM-DD): 2018-04-01	Activity End Date (YYYY-MM-DD): 2023-03-31

1. Performance Measures

In the performance measures table below, please provide the results and achievements that were finalized during the reporting period. Do not include results that are not final or that will continue to be developed. It is quite possible that in the first year or two, there may not be any results to report. Please see Annex A for a description of each performance measure.

	Performance Measures	**Results Achieved**	Provide a brief description of each final result achieved during the reporting period.
1.	Number of highly qualified personnel (HQP) working on funded activities (HQP refers exclusively to current Master and PhD students)	Not Collecting	
2.	Training/Knowledge transfer events		
	2.1 Number of training/knowledge transfer events organized by the recipient	Not Collecting	
	2.2 Number of presentations made in training/knowledge transfer events	1	Nilsen, K, and M. Entz 2020. Breeding organic oats for western Canada/Participatory Plant Breeding. Presented as a guest lecture to the University of Manitoba, Advanced Plant Breeding graduate course taught by Professor Rob Duncan. 2020, February 7. (Virtual)
3.	Number of participants at training/knowledge transfer events	Not Collecting	
4.	Number of new knowledge transfer products developed	0	
5.	Number of papers published in peer reviewed journals	0	

6.	Number of new technologies (new products, practices, processes and systems) that are developed	0	
7.	Number of new technologies (new products, practices, processes and systems) that are assessed under research conditions	Not Collecting	
8.	Number of new technologies (new products, practices, processes and systems) that are demonstrated on-farm or in-plant	Not Collecting	
9.	Number of new technologies (new products, practices, processes and systems) that attain Intellectual Property (IP) protection	0	
10.	Number of new technologies (new products, practices, processes and systems) that are utilized	Not Collecting	

2. Summary of Activity

Please provide a high-level summary of this activity that includes an introduction, objectives, methodology, deliverables, results and discussion. Technical language can be used in this section.

Executive Summary

Organic oat growers, processors and consumers continue to ask for cultivars developed for their unique systems and needs. Organically-produced versus conventionally-produced oat still fetches a premium price (Organicbiz.ca 2017). The project to develop milling quality oat cultivars suitable for organic production in western Canada will focus on the identification and evaluation of oat germplasm with high levels of genetically conferred disease resistance. The anticipated outcome is oat cultivars with disease resistance, especially to oat rusts, and hopefully with improved resistance to fusarium head blight. These oat cultivars will also have acceptable milling quality, suitable for organically managed production systems in western Canada, and for the ever-increasing organic markets.In achieving this objective, this activity will address the Priority Research Areas identified by the Organic Sector\"1. Increasing competitiveness through improvements in productivity, production stability and resiliency with climate extremes and/or quality of product, including: Breeding - Developing/identifying crop cultivars adapted to regional organic management, resilient to pest pressure, adapted to use nutrients efficiently\" and \"Pest (disease) management strategies - with an emphasis on prevention, for cereal crops (e.g. fusarium head blight, rusts etc.)\"Another identified area of Priority Research will be addressed: \"Improving quality of organic products through improved nutritional value through management practices and cultivar selection\", achieved through the step-wise improvement of the nutritional quality of the developed organically-suited milling oat cultivars. Increases in nutritionally beneficial soluble fibre (β-glucan) and protein content will be made.Developing disease resistant cultivars for organic oat production will also improve public good and environment health will be improved through reducing or eliminating fungicide use to combat disease in non-resistant cultivars.

2020-2021 Report Executive Summary

The goal of this project is to develop milling quality oat cultivars suitable for organic production in western Canada, and potentially across Canada. The desired outcome is to develop oat cultivars that perform well under organic management systems. The program has recently released the first two organically bred cultivars for western Canada, AAC Oravena and AAC Kongsore.

During 2020, we faced the unprecedented challenge of navigating a global pandemic that emerged during one of the busiest times of the year for the program. As a result, restrictions were put in place by AAFC on what could be planted in the field, and approval was given only to plant advanced generation tests. Despite the COVID related challenges, this project benefitted from external collaborations with the University of Manitoba, the University of Alberta, and our contracted work to run organic yield testing. Together this helped to minimize the impacts of COVID19, and the near term project health is good. All generations were advanced in 2020-21, and the breeding pipeline remains full. A more cautious longer term outlook will be required due to future COVID19 restrictions that could impact the program in 2021 and beyond.

Highlights.

- The Western Cooperative Oat Registration Test (WCORT) was planted at 13 locations in western Canada in addition toinoculated disease nurseries at Morden. The test included 30 entries, of which two were organic lines (second year line OT8008, and first year line OT8010). OT8010 was advanced for a second year of testing.

- Pre-registration B organic (BORG) tests (25 entries) were conducted at organically managed locations across western Canada and the USA, including inoculated disease nurseries at Morden (Crown Rust, Stem Rust, FHB). Data were analyzed and compiled, and 1 line (OT8011) was selected for entry into the 21WCORT test as first year entry.

- Preliminary Organic Yield (PRELO) tests(143 entries) were grown as multi-location single replicate trials under organic and conventional management. Of these, 14 lines were advanced to the 21BORG for further testing.

- Molecular marker screening was performed to track the pyramiding of known resistance genes into advanced breeding lines. Continued efforts are being made to develop new molecular markers for use in the breeding program.

- Early-mid generation organic breeding material was grown as a combination of hills and bulk plots in New Zealand and were rated for crown rust, stem rust and BYDV. 108 lines were selected for entry into the 21PRELO. 30 segregating populations were selected and advanced for the 2021 Early Generation Organic Nursery.

- Parents were selected and new crosses were initiated by choosing parents with good performance under organic management with acceptable disease resistance. Progeny from these crosses were advanced in the greenhouse and will be increased in 2021.

The full extent of operations moving forward will be impacted by the evolving COVID19situation, and will require careful monitoring and flexibility from the project team.

Objectives

Development of milling quality oat cultivars suitable for organic production in western Canada, and potentially across Canada
Description: Development of milling quality oat cultivars suitable for organic production in western Canada, and potentially across Canada
Outcome: Oat cultivars that perform well under organic management systems
Performance Summary:

Report 2021. OT8008 was tested for a second year in the 2020 WCORT, and OT8010 was tested as a first year entry. OT8008 performed well in the WCORT, it was among the highest yielding lines in the test over 2 years. Some concerns were noted related to the milling quality of the line,therefore it was recommended by our industry partner to not seek support for registration of OT8008. However, OT8010 performed well in its first year of testing, and had very good milling quality attributes, therefore this line will be advanced to a second year of WCORT testing. A new entry, OT8011,which performed well during pre-registration testing will be advanced to the 2021 WCORT. This line was derived from the Participatory Plant Breeding program, and should it perform well in the WCORT, would be a major achievement for the project.

Milestones

Organic Oat Breeding
Activity: Organic Oat Breeding / Oat cultivars specifically developed for organic production systems in Canada
Milestone / Deliverable: Field Tour
Progress Summary: (In Progress)

Report April 2021. Due to COVID19 pandemic the normal field tour was not held due to restrictions. However, a private tour hosted by Dr. Nilsen was arranged with Dawn Popescul, Interim Executive Director of POGA on Monday September 14th, 2020. This tour consisted of a visit to the Brandon research plots on Quintaine's field near Brandon, MB. Dawn was able to observe thepreliminary organic oat yield plots and harvest activities that were underway during the tour.

Organic Oat Breeding
Activity: Organic Oat Breeding / Oat cultivars specifically developed for organic production systems in Canada
Milestone / Deliverable: Annual Report
Progress Summary: (In Progress) The Annual Report will be prepared and submitted on time to fulfill this deliverable.

Organic Oat Breeding
Activity: Organic Oat Breeding / Oat cultivars specifically developed for organic production systems in Canada
Milestone / Deliverable: Meeting with Industry Partner
Progress Summary: (In Progress)
Report 2021. The annual meeting with industry partners was held January 25th, 2021. This meeting was held virtually due to the COVID19 pandemic. The Western Cooperative Oat Registration Trial Report data were presented so decisions could be made on which line(s) should be presented at the PGDC-PRCOB to request support for registration. During the meeting it was decided that the organic line OT8008 not be advanced for request for support. The decision was made to advance OT8010 to a second year of WCORT testing.

3. Issues

- Describe any challenges or concerns in achieving the results and deliverables of this activity during the reporting period. How were they overcome or how do you plan to overcome?
- Describe any potential changes to the work plan and the budget during the reporting period. How were or how will they be managed?

Report April 2021.

The COVID19 pandemic delayed normal operations in the spring. As a result we were later than usual to get trials setup and planted. Indoor activities such as crossing and germplasm increase were postponed, and reduced. However, the program was able to resume these activities during late summer/fall 2020.

Over the winter new contracts were initiated to run the B organic field tests. Since the initiation of the previous contracts 3 years ago, the asking price for organic research plots has been increasing. It was difficult to get contractors to agree to continue with the status quo price of $100 per plot. If future projects are successfully funded, it will be important to initiate contracts that cover the entirety of the funding cycle to avoid this issue.

In January 2021, it was announced that the small plot research sites run by BCGPA at Dawson's Creek and Fort St. John will be discontinued. Therefore we will not be running organic yield tests (WCORT, BORG) at this location for the remainder of the project.While unfortunate, theimpact on the project is expected to be small, offset by our robust network of 9 existing organic field testing sites across western Canada and North Dakota. For this year, arrangements were made to move the WCORT siteto Portage MB, and we will continue to pursue options for a replacement site to host the BORG in 2022.

4. Key Achievements

A key achievement represents a significant achievement or tangible result that could potentially be applied either by farmers or industry or the science community. In one to three paragraphs, please provide key achievements that meet one of the following criteria:

1) The item has commercial potential (all testing and piloting has been completed);
2) The item has been commercialized; or
3) The item has been adopted by sector.

Examples of tangible results could include increased sustainability (beneficial management practice), reduced costs, improved productivity or increased profitability. Please note that the information provided will be used for communication purposes only.

If no key achievements have been realized at this stage, please leave this section blank.

AAC Oravena is just coming onto the certified acreage in western Canada. It will be interesting to see if it can garner a good percentage of the organic oat acres in the next few years.

Annex A

Performance Measures Table	
Performance Measures	**Description**
1. Number of highly qualified personnel (HQP) working on funded activities	This only includes individuals who are registered in Master or PhD programs and are working on activities that receive funding through the Canadian Agricultural Partnership. They are only counted in their first year working on projects. For each reported HQP, please provide the following: the name of the student, level of degree, field of study and name of the institution.
2. Training/knowledge transfer events	
2.1. Number of training/knowledge transfer events organized	This includes events completed in the reporting year that were organized under the project to share results of the activities with audiences who may use that knowledge in the future. Examples could include training events, scientific meetings, symposia, conferences, workshops, industry meetings, field days or webinars. Annual General Meetings do not normally qualify for this category as they are considered to be part of normal day-to-day business. For each reported item, please provide the following: name of the event, name of the organizer and organization, location, and year/month/day.
2.2. Number of presentations made in training/knowledge transfer events	This includes oral presentations and poster presentations at events that are not organized by the recipient, for example conferences, symposiums or training events. For each reported item, please provide the following: name of presenter, title of presentation, name of the event, location, and year/month/day.
3. Number of participants at training/knowledge transfer events	This includes individuals who attend the events listed and who may use that knowledge in the future.
4. Number of new knowledge transfer products developed	New knowledge could include, but is not limited to: 1) newly acquired knowledge that differs significantly from previously acquired knowledge; 2) existing knowledge that is enhanced to meet different requirements; 3) existing knowledge that is applied in different situations. These are knowledge transfer materials created under the project that have been disseminated to transfer information to audiences who may use that knowledge in the future. Examples could include brochures, factsheets, flyers, guides, articles in trade magazines, technical bulletins and social media items. Only the number of products developed should be reported, not the number of copies that were printed and disseminated. For each reported item, please provide the following: author(s), title of the item, type of the reported item (e.g. brochure), name of the trade magazine/publisher and page number(s) if applicable, and year/month/day.
5. Number of papers published in peer reviewed journals	This includes scientific papers that are published in peer reviewed journals. Papers that are not yet published (ex. manuscripts in preparation, under review or accepted) should not be reported. For each reported item, please provide the following: author(s), year of publication, article title, title of journal, volume (issue), and page

	number(s). If the item is a book or a book chapter, add name of publisher. If the item is an article for conference proceedings, add title of published proceedings, location, and year/month/day.
6. Number of new technologies (new products, practices, processes and systems) that are developed	A new technology could include, but is not limited to: 1) a newly created technology that differs significantly from existing technologies; 2) an existing technology that is modified to meet different requirements; 3) an existing technology that is tested in different situations. New products are goods and services that differ significantly in their characteristics or intended uses from products previously produced and used. Examples could include equipment, software, novel foods or consumer goods. New practices are new agronomic techniques or methods that can be applied directly by producers. New processes are the set of operations performed by equipment in which variables are monitored or controlled to produce an output in labs or processing facilities. New systems are the set of detailed methods, procedures and routines created to carry out a specific activity, perform a duty, or solve a problem. Development consists of the creation of a new product, the generation of a new practice, or the demonstration of utility of a new process or system. This category does not include new varieties. New varieties are only reported under 'Number of new technologies that attain Intellectual Property protection' and/or 'Number of new technologies that are utilized'. Gene sequences, breeding lines and populations are not eligible under this category. To avoid duplication, for any new technologies, only set a target that represents the last stage in the innovation process. For example, a new technology is either developed, or assessed, or demonstrated or utilized.
7. Number of new technologies (new products, practices, processes and systems) that are assessed under research conditions	See the definition of new technologies under #6. Are assessed: when new technologies are evaluated or tested under research conditions. This category does not include new varieties. New varieties are only reported under 'Number of new technologies that attain Intellectual Property protection' and/or 'Number of new technologies that are utilized'. Gene sequences, breeding lines and populations are not eligible under this category. To avoid duplication, for any new technologies, only set a target that represents the last stage in the innovation process. For example, a new technology is either developed, or assessed, or demonstrated or utilized.
8. Number of new technologies (new products, practices, processes and systems) that are demonstrated on-farm or in-plant	See the definition of new technologies under #6. Are demonstrated: when new technologies are presented to the sector by experiments, prototypes, examples or pilot on-farm or in-plant.

	This category does not include new varieties. New varieties are only reported under 'Number of new technologies that attain Intellectual Property protection' and/or 'Number of new technologies that are utilized'. Gene sequences, breeding lines and populations are not eligible under this category. To avoid duplication, for any new technologies, only set a target that represents the last stage in the innovation process. For example, a new technology is either developed, or assessed, or demonstrated or utilized.
9. Number of new technologies (new products, practices, processes and systems) that attain Intellectual Property (IP) protection	See the definition of new technologies under #6. Examples for IP protection could include, but are not limited to: plant breeder rights, patents filed, registered trademarks and copyrights, and registered germplasms and released varieties (excluding breeding lines and gene sequences). For each new variety, please provide the registration number, the variety name and year/month/date.
10. Number of new technologies (new products, practices, processes and systems) that are utilized	See the definition of new technologies under #6. Are utilized: when new technologies are adopted or implemented for use within the sector. Examples may include, but are not limited to: a signed license agreement, a signed letter of intent, a new product that is available on the market, and a new practice which is adopted by farmers. Gene sequences, breeding lines and populations are not eligible under this category. To avoid duplication, for any new technologies, only set a target that represents the last stage in the innovation process. For example, a new technology is either developed, or assessed, or demonstrated or utilized.