



### AgriScience Program

## 2021-2022 Annual Performance Report

Name of Recipient: The Prairie Oat Growers Association	
Project Title: ASP-004 POBC Prairie Oat Breeding Consortium/ASP-004 Consortium de sélection d'avoine des Prairies	
Project Number: CAP-J-002038 ASP-004 POBC	Period Covered by Report (YYYY-MM-DD to YYYY-MM-DD): 2021-04-01 to 2022-03-31
Activity #: ASP-004 Name of Activity: POBC Prairie Oat Breeding Consortium/ASP-004 Consortium de sélection d'avoine des Prairies	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	3	<ol style="list-style-type: none"> <li>1. 3.1.2 Speaker / Presenter Kirby Nilsen. AAFC Oat Varieties: What's New, On Its Way, and Good for Alberta Producers. Alberta Oat Growers Association AGM. 2022/01/24.</li> <li>2. 3.1.2 Speaker / Presenter Kirby Nilsen. Oat Breeding: What's Hot New and Coming Soon. Manitoba Oat Growers Association AGM. 2021/02/10</li> <li>3. 3.1.2 Speaker / Presenter Kirby Nilsen. Oat Research and Variety Development at AAFC. Grainews: Hot Topics in Commodities – Oats (webinar). 2021/04/1.</li> </ol>



3.	Number of participants at training/knowledge transfer events	Not Collecting	1. 50 2. 25 3. Undetermined (virtual, online video)
4.	Number of new knowledge transfer products developed	1	1. 1.1.10 Report 2021 Western Cooperative Oat Registration Trial (WCORT), Conducted by the Prairie Grain Development Committee.
5.	Number of papers published in peer reviewed journals	2	1. 1.1.4 Chapter in Book Walkowiak S., Pozniak C.J., Nilsen K.T. (2022) Recent Advances in Sequencing of Cereal Genomes. In: Bilichak A., Laurie J.D. (eds) Accelerated Breeding of Cereal Crops. Springer Protocols Handbooks. Humana, New York, NY. <a href="https://doi.org/10.1007/978-1-0716-1526-3_1">https://doi.org/10.1007/978-1-0716-1526-3_1</a> 2. J. Mitchell Fetch, Deon Stuthman, Kirby Nilsen, Andrej Tekauz, P.D. Brown, Nancy Ames, James Chong, T. Fetch, Dr. Steve Haber, J. G. Menzies, Fred Townley-Smith, K. D. Hamilton, Denis Green, and Roger A. Caspers. (2022). AAC Justice oat. <i>Canadian Journal of Plant Science. Just-IN</i> <a href="https://doi.org/10.1139/CJPS-2021-0233">https://doi.org/10.1139/CJPS-2021-0233</a>
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**  
**Executive Summary**



The objective of the Prairie Oat Breeding Consortium (POBC) is to develop new oat cultivars suited to production in western Canada, and suited to end use markets identified by the Prairie Oat Growers Association (POGA) and the milling industry. These cultivars will be developed as efficiently and effectively as possible. The cultivars developed will have end-use quality identified as important by the industry and will carry genetic resistance to major diseases, pests, and adverse environmental conditions prevalent in the planned production areas. This project will address several of the priority areas identified in the new Canadian Agricultural Partnership Policy Framework, including helping oat producers and the oat industry to use science and innovation to increase their productivity and become even more resilient. It could enable the farmers and oat food processors to become more competitive by increasing their export capacity and addressing the needs of new markets around the world. The project, through the development of cultivars that are genetically resistant to pests and adaptable to various climatic conditions, will help producers be more resilient by reducing the following: the cost of growing oats, the fossil fuel use and greenhouse gas emissions and the amount of pesticides used in oat production. Many of the industry partners in this project focus on adding value to the producer's oat crop, directly addressing the priority for growth in Value-added Agriculture and Agri-Food Processing. Risks to the producers and the oat processing industry will be reduced by oat cultivars that perform better agronomically, are resistant to pests and produce reliably healthy products for the human and animal consumers, in Canada and around the world. This will also increase the Public Trust in the Canadian oat crop as a whole.

### **2021-2022 Report Executive Summary**

The 2021 season benefitted from loosening of COVID-19 restrictions versus a year prior. As a result, we were able to plant a normal field program in 2021, in contrast to the 2020 season during which planting was restricted to advanced generations only. Field operations in 2021 were challenged by historic and widespread drought conditions across most regions in western Canada. Oat yields in western Canada were ~70% of the 5-year average across our network of testing sites. A few sites were abandoned due to the extreme growing conditions, but most produced usable data. Differential responses to drought and heat were observed in our breeding material, and selections were able to be made partly based on climate resiliency under unfavorable growing conditions. Extreme drought conditions affecting the town of Morden restricted our ability to irrigate, which led to lower than normal disease establishment in our advanced generation disease nurseries. In contrast, our artificially inoculated early generation nurseries at Brandon had good disease establishment, especially for oat stem rust, allowing selections to be made based on disease resistance. Essential duty travel within Canada was approved to perform required field inspections including to our satellite location at the Lacombe-RDC. In addition, travel to other field locations across western Canada was resumed. The Project Lead was approved to attend some in person events including the POGA AGM and the Alberta Oat Growers AGM to connect with members of industry and growers. Annual travel to our contra-season nursery in Palmerston, NZ was once again not possible in 2021/22 due to ongoing international travel restrictions, but we hope to resume this aspect of the program in 2022/23. Substantial progress continues to be made towards developing new milling oat varieties for western Canada. PBR and VRO trials have been completed for AAC Wesley (OT2129) approved for registration in 2021 and licensed to FP Genetics. PBR testing has now concluded for AAC Douglas, which was supported for registration in 2019 and licensed to SeCan. Two promising new varieties from our program (OT2134 and OT2138) received support for registration at the annual PGDC (Prairie Grain Development Committee) meeting in March 2022. Although the ongoing pandemic continues to present some challenges to breeding operations, we expect the situation will continue to improve in the year ahead.

### **Overview of 2021 breeding operations**

#### **Agronomic Testing (yield plots):**

- Western Cooperative Oat Registration Test (WCORT): 36 entries at 11 locations (Brandon, Kelburn Farm, Indian Head, Melfort, Morden, Portage, Beaverlodge, Lacombe, Kernen, Swift Current, Lethbridge).



- BOAT: 49 entries at 6 locations (Brandon, Lacombe, Indian Head, Melfort, Morden, Beaverlodge, Lethbridge).
- Preliminary Yield Test (PRELP): 200 entries at 3 locations (Brandon, Lacombe, Portage).
- F5 Yield Test: 464 entries at 2 locations (Brandon, Lacombe).

\* For all agronomic tests, selections were made based on yield, heading, maturity, height, lodging, TWT, KWT, plumps, and thins.

#### Collaborative Tests:

- ENCORE : 211 entries at 4 locations (Brandon, Lacombe, Saskatoon, Ottawa).
- UMOPN : 36 entries at 2 locations (Brandon, Lacombe).
- Quaker Area Test: 20 entries at 1 location (Brandon).
- MCVET: 5 entries at 1 location (Brandon).

#### **Pathology:**

- 534 advanced breeding lines evaluated in rows at the Morden RDC for smut, crown rust, and stem rust (WCORT, BOAT/ENCORE, UMOPN, PRELP).
- 36 entries evaluated for FHB/DON (WCORT).
- 85 entries (WCORT, BOAT) were evaluated for BYDV under contract at University of Illinois.

\* For advanced generation breeding lines, selections were made based on resistance to crown rust, stem rust, smut, BYDV and FHB.

#### **Grain Quality Analysis (Cereal Quality Lab)**

- 1176 harvested CODEMA dehulled whole-meal oat samples were scanned with NIR.
- Selections were made based on hull percentage, beta-glucan, protein, and oil content.

#### **Genomics**

- 1000 early generation (F4) lines from 5 populations were sampled for genomic selection.
- 80 selections were advanced based on genomic predicted grain yield and beta-glucan.
- Molecular activities resumed at Brandon with the hiring of a term EG-03 technician to support the work. Screening of parental and breeding lines was initiated targeting crown rust resistance genes *Pc94* and *Pc98*.

#### **Early Generation Nurseries**

- 39,000 early generation single seed hills (F2-F4), planted at 2 irrigated locations (Brandon Beach and Jail Fields) artificially inoculated with smut, crown rust, stem rust. Single plant selections were made based on disease resistance, height, and lodging.
- UEOPN: 24 entries at 1 location (Brandon Jail Field).

#### **Contra Season Increase (Palmerston, NZ, 2021/22):**

- 2235 paired hills (F2-F5).
- 76 bulk increase plots.
- Ratings and selections were made for crown rust, stem rust, seed color, lodging and height.

#### **Post-Registration**

- PBR/VROtest :9 entries, 1 location (Brandon).
- Short breeder Rows: 250 breeder rows for each of OT8010, OT8011, OT2139, OT2140, OT2141, OT2142 were grown at Brandon.



- Long breeder rows: (breeder seed production): 225 long rows for each of OT2134, and OT2138 were grown at Indian Head, SK.

### **Objectives**

Description: The objective of the Prairie Oat Breeding Consortium (POBC) is to develop new oat cultivars suited to production in western Canada and suited to end use markets identified by POGA and the milling industry. These cultivars will be developed as efficiently and effectively as possible.

Outcome: New oat cultivars that will be produced on a significant acreage and utilized by processors and the milling industry. The cultivars developed will have end-use quality identified as important by the industry and will carry genetic resistance to major diseases, pests, and adverse environmental conditions prevalent in the planned production areas.

### **Performance Summary: (In Progress)**

OT2129 received support for registration in 2021 and was successfully licensed to FP Genetics and assigned the name 'AAC Wesley'. PBR and VRO trials for AAC Wesley were completed in the summer of 2021, and all documents were submitted to the PBR/VRO office. PBR trials were also concluded for previously registered variety AAC Douglas in 2021. In March 2022, two new lines received support for registration at the annual PGDC meeting (OT2134 and OT2138).

OT2134 is a high yielding yellow hulled oat line that combines short plant height with high yield potential and excellent lodging resistance. It is adapted to growing regions across western Canada. Maturity is similar to Summit and AC Morgan. It has good test weight, thousand kernel weight, plumps and very low thins with acceptable groat percentage. OT2134 has good protein,  $\beta$ -glucan content with very low oil content that is lower than all the checks. Disease reactions indicate OT2134 is resistant to smut, intermediate to Barley Yellow Dwarf virus, moderately susceptible to oat crown rust and intermediate to oat stem rust. Low DON levels indicate it has an intermediate response to Fusarium Head Blight.

OT2138 is a white hulled oat with high test weight and an excellent disease package, intermediate plant height and good lodging resistance. It is adapted to growing environments across western Canada. Maturity is similar to Summit and AC Morgan. It has very good test weight, plumps and very low thins with a high groat percentage. OT2138 has good protein (16.7%), and a high  $\beta$ -glucan content (5.3%) that exceeds the range of the checks. It has moderate oil content that is within range of the checks. Disease reactions indicate OT2138 is resistant to smut, moderately resistant to Barley Yellow Dwarf virus, moderately resistant to oat crown rust and intermediate to oat stem rust. Low DON levels indicate it has an intermediate response to Fusarium Head Blight.

### **Milestones**

POBC

Activity: Annual Meeting with Industry Partners

Milestone / Deliverable: Meeting with Industry Partner

An ANNUAL meeting is held with the industry partners (sometime during this period) to discuss merits of breeding lines being advanced within the program, and potential lines to obtain support for registration.

### **Progress Summary: (Completed)**

The annual meeting was held February 3rd, 2022. This meeting was once again held virtually due to the ongoing 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. It was decided that two lines would be presented for request for support (OT2134, OT2138). The decision was made to advance one line (OT8011) from 1st year to 2nd year of testing in the 22WCORT.



POBC

Activity: Annual Report

Milestone / Deliverable: Information and data will be collected for an annual report submitted to appropriate recipients

**Progress Summary: (Completed)**

The Interim report will be submitted by the deadline of May 15, 2022.

POBC

Activity: Annual Field Tour

Milestone / Deliverable: Field Tour

**Progress Summary: (Partially Met)**

Due to the pandemic, our normally planned in person field tour was deferred for 2021. Private tours were conducted over the summer. One with Jenneth Johanson, President of POGA who visited the research plots at Quintaine's field, and disease nurseries at Jail and Beach fields at Brandon. We also held two additional private tours with seed company representatives to discuss new oat lines coming through the pipeline. We hope to return to conducting the in person field tour in August 2022.

### 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 2022.

Several members of the original project team have recently departed AAFC, including Curt McCartney, Dave Niziol, and Nancy Ames. Tom Fetch recently announced his upcoming retirement in summer 2022. Replacing these positions will be important for the oat breeding program moving forward.

### 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 Wesley (OT2129) is on the path towards commercialization, and AAC Douglas (OT2122) will be commercially available in 2022. It will be exciting to see these varieties can gain acreage with producers in western Canada.





## Annex A

Performance Measures Table	
Performance Measures	Description
1. Number of highly qualified personnel (HQP) working on funded activities	<p>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.</p> <p>For each reported HQP, please provide the following: the name of the student, level of degree, field of study and name of the institution.</p>
2. Training/knowledge transfer events	
2.1. Number of training/knowledge transfer events organized	<p>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.</p> <p>Annual General Meetings do not normally qualify for this category as they are considered to be part of normal day-to-day business.</p> <p>For each reported item, please provide the following: name of the event, name of the organizer and organization, location, and year/month/day.</p>
2.2. Number of presentations made in training/knowledge transfer events	<p>This includes oral presentations and poster presentations at events that are not organized by the recipient, for example conferences, symposiums, or training events.</p> <p>For each reported item, please provide the following: name of presenter, title of presentation, name of the event, location, and year/month/day.</p>
3. Number of participants at training/knowledge transfer events	<p>This includes individuals who attend the events listed and who may use that knowledge in the future.</p>
4. Number of new knowledge transfer products developed	<p>New knowledge could include, but is not limited to:</p> <ol style="list-style-type: none"> <li>1) newly acquired knowledge that differs significantly from previously acquired knowledge;</li> <li>2) existing knowledge that is enhanced to meet different requirements;</li> <li>3) existing knowledge that is applied in different situations.</li> </ol> <p>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.</p> <p>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.</p>
5. Number of papers published in peer reviewed journals	<p>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.</p> <p>For each reported item, please provide the following: author(s), year of publication, article title, title of journal, volume (issue), and page</p>





	<p>number(s).</p> <p>If the item is a book or a book chapter, add name of publisher.</p> <p>If the item is an article for conference proceedings, add title of published proceedings, location, and year/month/day.</p>
<p>6. Number of new technologies (new products, practices, processes and systems) that are developed</p>	<p>A new technology could include, but is not limited to:</p> <ol style="list-style-type: none"> <li>1) a newly created technology that differs significantly from existing technologies;</li> <li>2) an existing technology that is modified to meet different requirements;</li> <li>3) an existing technology that is tested in different situations.</li> </ol> <p>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.</p> <p>New practices are new agronomic techniques or methods that can be applied directly by producers.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>
<p>7. Number of new technologies (new products, practices, processes and systems) that are assessed under research conditions</p>	<p>See the definition of new technologies under #6.</p> <p>Are assessed: when new technologies are evaluated or tested under research conditions.</p> <p>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.</p> <p>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.</p>
<p>8. Number of new technologies (new products, practices, processes and systems) that are demonstrated on-farm or in-plant</p>	<p>See the definition of new technologies under #6.</p> <p>Are demonstrated: when new technologies are presented to the sector by experiments, prototypes, examples or pilot on-farm or in-plant.</p>



	<p>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.</p> <p>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.</p>
<p>9. Number of new technologies (new products, practices, processes and systems) that attain Intellectual Property (IP) protection</p>	<p>See the definition of new technologies under #6.</p> <p>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).</p> <p>For each new variety, please provide the registration number, the variety name and year/month/date.</p>
<p>10. Number of new technologies (new products, practices, processes and systems) that are utilized</p>	<p>See the definition of new technologies under #6.</p> <p>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.</p> <p>Gene sequences, breeding lines and populations are not eligible under this category.</p> <p>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.</p>