

Value Chain Discovery of Canadian Participatory Plant Breeders

by

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The University of Manitoba

in fulfilment of the requirements of the degree of

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Abstract

Participatory Plant Breeding (PPB) is an approach to plant breeding for agriculture that puts farmers in the driver's seat of variety development, with implications for farmer empowerment, decentralization of power in agriculture, and climate change. The University of Manitoba Participatory Plant Breeding Program (in partnership with the Bauta Family Initiative on Canadian Seed Security) has developed farmer crops to the point that they are starting to be commercialized, but questions remain about the socio-economic landscape that these participatory crops will enter. Who will buy them? Why? What barriers will they encounter in entering the market? This exploratory research endeavoured to answer these questions by investigating the value chains of participant farmers – the material path that their crops follow from farmer to eater, the various actors along this chain, and the socio-economic orientation of these actors. It did this through semi-structured interviews and, as a practicum, produced a series of deliverables. An Integrated Project Plan that structured the investigation was developed with project partners and the study indicated the current state of commercial development as well as practical considerations for the continued commercialization of PPB cultivars. Interview data was coded based on broad categories derived from the literature, conversations with project partners, and emergent themes from interviews. Coded content was then used to create detailed farmer profiles and a summary document of the research. Project deliverables included the development of a background report on PPB and commercialization, a summary report of the data including brief case summaries for each farmer, and then detailed farmer profiles. Farmer profiles uncovered the complexity and variety of farmers' agro-economic contexts, while the summary report demonstrated common patterns in participants' current value chains, the PPB commercialization prospects within these chains, and the barriers facing commercialization – both institutional and on-farm. Results indicate that PPB commercialization is entirely possible, but must be approached strategically, and in a different way than conventional variety development.

Acknowledgement

The ten farms included in this study are on the traditional territories of over 30 Indigenous nations within Canada. Of these farms, four are on numbered treaties and two are on named treaties. The four other farms are in areas that remain unceded to colonial governments. I live, and produced this report, in the city of Winnipeg which falls in Treaty One Territory. Treaty One Territory is on the traditional lands of the Anishinaabe, Ininew, Oji-Cree, Dene and Dakota people. It is also the heart of the Métis Nation Homeland.

It is critical to acknowledge and address Canada's colonial history – one that has, and continues, to benefit from the displacement and genocide of Indigenous nations. This includes the elements of colonization that are unique to agriculture and food systems. Indigenous cultures cultivated food and seed on this land for millennia. Seed producers, growers and consumers would not be here without the influences of Indigenous peoples on the seeds that nourish us today. Likewise, traditional landrace crops play an integral role in fostering present-day global agrobiodiversity and remain crucial in the diets of humans worldwide.

Thank You

I thank the participants in this study who have given their time and expertise over and above what could be expected, and their dedication to finding new paths in agriculture. Their vision moves us toward a liveable climate future where we sustain ourselves and give back to the earth instead of just taking from it.

Thank you as well to my project partners at the Bauta Family Initiative on Canadian Seed Security and my committee for their good faith in this process and their contribution to sustainable food futures. This includes my professional partners Dr. Helen Jensen and Aabir Dey, as well as Dr. Martin Entz. Críostaigh Ó Ceallaigh-Bisson and the entire Bauta staff were also very generous with their time.

A debt of gratitude is owed to Kicking Horse Coffee Co. Ltd, the inventor of the French press, and The Nook Diner in Winnipeg.

I thank Dr. Iain Davidson-Hunt whole-heartedly for his patience and astuteness as an advisor.

Finally, thank you to my parents, partner, and grandpa for the multiple ways they have supported me and for their great advice in this process. They have always kept me level.

Introduction to Practicum Document

This practicum document consists of three chapters laid out in the following table of contents and it fulfils the requirements of the Masters of Natural Resources Management degree. The practicum is a chance to manage a project developed in collaboration with a professional partner, beginning with the production of an Integrated Project Plan (IPP). The plan lays out a series of deliverables – practical results from the project – that are achieved through execution of the IPP. The final piece is a Critical Reflection on the process and outcomes of project development and execution.

Please note that Deliverable 1 – Critical Issues Identification Report - is now in the deliverables section and not the IPP. Deliverable 3 has also been changed to 'Detailed Farmer Profiles' instead of an interactive map, as had been indicated in some previous project development documents. These decisions, made with the project advisor and the project partner, are noted in the change log which can be found in the appendices.

Contents

Chapter 1: Integrated Project Plan	7
Executive Summary	8
Project Charter	10
Scope Statement	15
Budget Summary	18
Resource Requirements & Procurement	19
Skills and Knowledge Acquisition Plan	19
Risk Management Plan	20
Quality Management Plan	22
Communications Plan	25
Project Schedule	29
Change Management Plan	32
Chapter 2: Project Deliverables	33
Deliverable 1: Critical Issues Identification Report	34
Sources	50
Deliverable 2: Summary Report	54
Executive Summary	55
1. Introduction	59
2. Participant Value Chains: Structure and Characteristics	60
3. Case Study Summaries	67
4. Status, Intentions, and Expectations for PPB commercialization	89
5. Dynamics and Patterns in PPB Commercialization	98
6. Barriers: Risk, Hurdles, and Gaps	112
Conclusion	119
Deliverable 3: Detailed Farmer Profiles	120
Chapter 3: Critical Reflection	158
Introduction	159
Project Execution	159
Competency Development	162
Contribution and Knowledge Development	163
Conclusion	166
Sources	167

List of Tables and Figures

Figure 1: The merging of farmer and researcher environment that occurs in PPB.....	37
Figure 2: Simplified depictions of two hypothetical PPB value chains	42
Figure 3: Comparison of traditional breeding practices and PPB at U of M.....	44
Figure 4: Research flow identifying the need for qualitative and value chain study in PPB.	49
Figure 5: Large Systems Diagram	63
Figure 6: Small Systems Diagram	66
Appendices	168

Chapter 1: Integrated Project Plan

Executive Summary

The objectives of this project are to:

1. Review existing knowledge on Participatory Plant Breeding (PPB) and value chains.
2. Understand the structure and qualitative characteristics of Canadian PPB Value Chains.
3. Communicate this understanding in a compelling way to the public and potential PPB value chain participants.

To this end, this work will produce several reports, including short value chain summaries for each chain, composite or hypothetical value chains depicting common patterns and barriers for PPB value chain development, and an overall report on PPB value chains. A background report serving Objective 1 is contained in Chapter 2 – project deliverables.

The subject of this work is the University of Manitoba Participatory Plant Breeding Program (UMPPB) which is delivered in partnership with the Bauta Family Initiative on Canadian Seed Security. UMPPB, headed by Dr. Martin Entz, carries out the practical, on-farm, and in-lab component of the program while the Bauta Initiative co-manages it through extension work and other resources for developing the program. The Bauta Family Initiative funds the program and acts as a 'public facing' component.

Discovering the composition of and values informing PPB plant population value chains can make the program more effective and make PPB more attractive to prospective participants. Crops require a market, and currently knowledge regarding markets for PPB products is either non-existent or is informal and not compiled in a structured format. The information gathered through this work will contain vital clues about what motivates participation and the opportunities and barriers presented to participants. It will also communicate living examples of PPB market development allowing prospective participants to envision how PPB applies to them. The results of this project should inform the process and goals of the UMPPB program and be made available in the recruitment of future participants.

Information will be gathered through semi-structured interviews, starting with participant farmers in the UMPPB program and working outwards to discover the composition of their PPB value chains. Data collection procedures will first interview UMPPB farmers to develop biographical information and narratives surrounding their experiences with UMPPB and value chain development. Interviews will unpack participants' multidimensional values and their approach to value chain development, and they will discover subsequent actors in the chain. The process is then repeated for emergent value chain actors until a comprehensive overview of each chain is achieved.

This project plan details what the project will produce and how it will be produced. It was developed as a series of components rounding out the project from its initial conception, leading to specific deliverables and requirements, and then detailed planning for delivery. The plan also elaborates on why this project is necessary. Appendices containing components which inform the main body of

the plan, as well as active documents for charting progress and managing change, can be found in the general appendices section of the full Practicum Document. The following is a guide to the content of this plan:

***Project Charter:** A preliminary and high-level outline of the project. It is approved by the project team and forms the baseline of agreement on how the project should proceed. It lays out project deliverables and the requirements of those deliverables - enabling further development of the final project plan. Subsequent documents such as the Scope Statement, Work Breakdown Structure, and Quality Management Plan are all grounded in the broad ideas laid out in this Project Charter.

***Scope Statement:** Sets the parameters of the project including what is or is not included in the study, as well as budget and timing considerations.

***Budget Summary:** A breakdown and description of all possible project costs and funding sources. Includes minimum, likely, and maximum total cost estimates.

Resource Requirements and Procurement: Details the resources (physical, digital, human) required to complete the project.

Skills and Knowledge Acquisition Plan: Details how the necessary skills and knowledge are to be acquired.

Risk Management Plan: Assesses and addresses possible risks to and from the project. Includes risk responses.

***Quality Management Plan:** Details the steps that will be taken to ensure quality. Includes risks to quality and steps to ensure quality.

Communications Plan: Outlines all the communications necessary for project completion. Includes internal communications for deliverable completion and external communications for the dissemination of deliverables.

***Project Schedule:** An updatable Gantt chart graphically depicting the timeline of all project tasks. It is the central organizing document. Includes milestones, task progress indicators, critical path tasks, task assignment, and practicum stages.

Change Management Plan: Details how changes - negotiable and non-negotiable - to the project plan will be considered, incorporated, and responded to.

Appendices: These are documents and preparatory work undertaken in the development of this project plan. They can now be found in the appendices of the full Practicum Document.

Project Charter

This Project Charter is a high-level look at the project, developed following project team agreement on the more unrefined Project Concept Document (See Appendix). It forms the baseline of agreement on how the project should proceed and takes a more detailed look at project deliverables and the requirements of those deliverables – allowing for further development of the final project plan. It was refined through a series of meetings noted at the bottom of the document and is the first point at which the roles and responsibilities of the project team are noted. Subsequent documents such as the Scope Statement, Quality Management, and Change Management are all grounded in the broad ideas laid out in this Project Charter.

Project Overview

This project will develop resources for the market development and improved understanding of PPB value chains. The specific outcomes (deliverables) of the project include thorough value chain discovery of PPB case studies and a document that synthesises the results of the study. The structure and characteristics of Canadian PPB value chains have not been systematically documented. By uncovering and communicating qualitative information about PPB value chains, this project will improve our understanding of PPB value chain development and help build the case for policy changes that encourage the practice of PPB. It will also demonstrate realistic commercial opportunities to potential farmer participants and value chain actors.

Justification

This project is intended to promote the value chain development and dispersal of Participatory Plant Breeding (PPB) populations through the discovery and communication of PPB value chains. The University of Manitoba Participatory Plant Breeding Program (UMPPB) in partnership with the Bauta Family Initiative on Canadian Seed Security has successfully developed participatory populations for oats, wheat, and potato. Though successful in population development, work is needed to increase the uptake and commercialization of the resulting populations.

Part of the problem is that the value/supply chains of PPB products are largely unknown. Discovery and demonstration of successful PPB value chains can offer some guidance to current farmer participants in the development of PPB value chains. It can also demonstrate realistic commercial opportunities to potential farmer participants and value chain actors. Additionally, representatives from the Bauta Initiative have expressed interest in the development of short value chains and how PPB relates to their development. Value chain discovery offers an opportunity to investigate this relationship.

Effectively communicating the findings of this value chain discovery to other farmers and value chain actors is a priority. This includes communicating both the basic flow of goods and services as well as the stories and experiences of study participants. Ultimately, the presentation of this study should allow viewers to situate PPB in their own contexts at various scales, locations, and market orientations.

PPB presents an opportunity to increase the security and of the Canadian seed system by building in redundancies and democratizing and demystifying the task of variety development for farmers. It constitutes a step towards seed sovereignty. Failing to investigate value chain could mean that PPB populations, which are beneficial socially and ecologically, do not extend beyond participant farmers and do not fulfil their potential to shift broader approaches to plant breeding for agriculture.

Project Objectives and Deliverables

Broad project objectives aim to document and communicate examples of PPB value chain development while inviting PPB participants to share and connect with each other along with potential value chain partners.

Specific project objectives:

1. Review existing knowledge on PPB and value chains.
2. Understand the structure and qualitative characteristics of Canadian PPB value chains.
3. Communicate this understanding in a compelling way to the public and potential PPB value chain participants.

Deliverables are conceived as SMART goals (Specific, Measurable, Attainable, Relevant, and Time-Bound) that address the objectives listed above. Completion of these deliverables as agreed to by the project team constitutes successful completion of the project.

Deliverables:

1. PPB and value chain critical issues identification report completed February 8
2. Value chain discovery of PPB products from PPB participant producer through to final consumers.
 - Creation of a PPB Value Chain investigation interview format by February 19

- Discovery and mapping of 10-15 PPB value chain cases by March 31
- Development of one-pager case study reports on each farmer.
- Summary report of case studies completed June 11

3. Detailed farmer profiles

- More in-depth reports on each case detailing value chain structure, commercial intentions and experiences, and information about value chain partners

Requirements

1. PPB and value chain critical issues identification report completed February 8

- Review key literature
- Identify critical issues

2. Value chain discovery of PPB products from PPB participant producer through to final consumers.

- Data collection through semi-structured interviews and participant observation
- Case selection criteria:
 - Drawn mainly from the University of Manitoba PPB (UMPPB) program
 - Represent each UMPPB commodity (potato, oats, wheat, and corn) prioritizing grains, then potato, and then corn if time permits.
 - Represent the diverse regions and market orientations of participant farmers
 - Can include incomplete value chains
 - Not all value chains are fully developed, yet the PPB process and engagement is important unto itself. Considering incomplete chains can communicate both experiences of participation and barriers to PPB value chain development.
- One-pager case reports:
 - Include experience of PPB participation
 - Include experience of and approach to value chain development
 - Include values informing choice to participate in PPB or PPB value chain
 - Engage with enabling factors and the barriers faced in value chain development
- Summary report:
 - Compiles interview results and distills themes – describing value chain experiences and characteristics in a broad sense

- Includes 'composite' value chains depicting common patterns and models of PPB value chain development, allowing for representation of chains that are currently informal or in development.
- Includes one-pager summaries for each case-study value chain

3. Detailed farmer profiles

- Contain details on
 - Value chain structure
 - Commercial intentions
 - Value chain partners

Note: This practicum project goes through university ethics review. All steps, procedures and deliverables will meet university ethics requirements to ensure the respect and safety of participants and mitigate any risks associated with the project.

Resource and Cost Estimates

Current Estimate: \$11297.21 CAD

See Budget Summary for details

Roles and Responsibilities

Interested Party	Role	Responsibilities
Murray Jowett	Grad student and project manager	Organize and execute the project plan. Responsible for completion of deliverables. Coordinate interested parties.
Iain Davidson-Hunt	Student Advisor	Guide research and overall project proceedings. Sit on MNRM practicum committee.
Martin Entz	Director, University of Manitoba Participatory Plant Breeding Program	Guide project direction. Act as project resource. Sit on MNRM practicum committee.
	Committee Member	

Aabir Dey

Director, Bauta Family Initiative

Guide project direction. Act as project resource. Sit on MNRM practicum committee as guest member.

Official project partner and committee member

Helen Jensen

National Research Program Manager, Bauta Family Initiative on Canadian Seed Security

Guide project direction. Act as project resource. Connect to case study candidates. Sit on MNRM practicum committee as partner.

Former project partner and committee member

Approvals (See Change Log for details of Charter changes)

Charter approved by team Nov. 19, 2020.

Aabir Dey takes role as official project partner at “Review of Draft Deliverable” meeting, May 11, 2022.

Charter change: Former Deliverable 3, ‘Interactive Map’ discarded May 13, 2022 in discussion with Aabir – see Meeting Log.

- Deliverable 3 changed to “Detailed Farmer Profiles”.

Scope Statement

Scope Overview

This section considers the size and scale of the project as well as what is included and not included in the work of the project. It sets parameters so that the project manager and project partners can have a shared understanding of how the project will proceed and the expectations of outcome. The following paragraphs outline the basic parameters of the project including deliverables, criteria for case study candidates, cost estimates, and number of cases studies. The subsections that follow consider exclusions from scope, time estimates, assumptions, project acceptance criteria, constraints, and how changes to scope will be managed.

This project is to be completed by August 2021, allowing approximately 6 months for the completion of a project plan, deliverables, and practicum requirements. Funding for farmer honoraria comes, with gratitude, from Helen Jensen's OFRF grant. All other costs are carried by Iain Davidson-Hunt and the University of Manitoba Natural Resources Institute. More information on cost can be found in the Budget Summary that follows the scope statement.

For the value chain discovery, study scope is limited to PPB participants who have established value chains or have at least established a market for their PPB products. Value chain discovery should be thorough and follow the value chain path of each PPB product as far as possible. Value chain participants include but are not limited to wholesalers, direct marketing venues, processors, distributors, and retailers.

The most pertinent and lingering question of scope is how many case studies can be expected to be completed in the 6 month timeframe. This discussion is dealt with in the scope management section and acceptance criteria.

Exclusions from Scope

This project looks exclusively at participants or past participants in the UMPPB and Bauta PPB field crops program and their resultant value chains. This means that crops beyond PPB wheat, potato, corn and oats are excluded from the project scope, as well as farmers outside of Canada. Further exclusions include the investigation of end-point consumers, outreach to prospective PPB participants and policy makers, and data analysis. These exclusions are discussed in the following paragraphs.

End-point consumers, or the people purchasing and consuming the final products, are not within the scope of this project. The focus of this study is internal to PPB value chains, and consumer engagement is a separate subject. End-point consumers are considered in this project insofar as they influence the participation and decision-making of value chain participants.

Communication and dispersal of project deliverables to a wider audience than current PPB farmers and value chain participants is also beyond the scope of my work. This audience includes prospective PPB farmers and value chain participants as well as policy makers. This is work that should be taken on by the project team or associated organizations at some point. My outreach work, however, ends at sharing the slide deck or briefing note with the Bauta Initiative for dispersal.

Finally, this work excludes qualitative and quantitative analysis of interview data and value chain structure. Interviews are used primarily to determine next steps in value chains and produce biographical/narrative information for farmers – not to generate statistically relevant conclusions. Qualitative instruments such as Nvivo coding software may be employed in the creation of the summary report, composite value chains, and one-page value chain summaries, but this will not constitute substantive qualitative analysis.

*Amendment from February 23 Approval Meeting: Value chain investigation will not include PPB populations sold as seed. Also, what had been Objective 4 “Connect PPB participants through a webinar” is now excluded, with the expectation and intention that Murray will present at a webinar in the fall, outside of project requirements. Elements related to Objective 4, including Deliverable 4 (webinar to connect PPB participants) and its requirements have been removed from the project plan. Finally, the requirement that corn value chains are included has been removed due to the limited number of PPB corn participants.

Time Estimates

Please see the Project Schedule for up-to-date time estimates.

Assumptions

1. Interviews will be carried out remotely either through virtual meeting or phone call.

Project Acceptance Criteria

This project will be considered complete once the value chain discovery documents/summaries have been submitted to the project team. The project should be considered acceptable if it meets the requirements set out in the project charter.

I will carry out as many case studies as possible within the allotted timeframe, with consideration of the work required of each case beyond interviews. This work includes the development of narratives and summaries. As the size of PPB value chains is not clearly known, the acceptable amount of case studies will have to be discussed with my advisor and the project team as information emerges.

Interested parties will indicate their acceptance via email. The project partner and committee will sign the official university documents indicating completion of practicum steps and objectives.

Constraints

Time: 6 months

Covid-19 Travel Restrictions: This has already been accommodated and interviews will be conducted remotely. Covid 19 does not present a significant constraint because travel is no longer required.

Farmer/Informant availability: The interview schedule will be highly dependent on participant availability. The allotted months should allow for agreeable dates for interviews to be found, given proactive contact and scheduling.

Scope Management Plan

I will keep my advisor and the project team informed if it appears that changes to scope are required. Changes may be the result of unforeseen factors or complications, but also may result from requests from the project team. I intend to be flexible and collaborative in team discussions regarding scope.

The number of case study value chains to be completed is estimated between 10-15. Changes to this number will be determined through discussions with the project team and partner. Estimates regarding how much information gathering is feasible in six months hinge largely on what project partners can tell me about the size, composition, and distribution of PPB value chains.

Budget Summary

The following list and cost estimates describe the project budget in detail. Discussions regarding study participant honoraria are still required, as well as the fee for translation services. Covid-19 has also made several costs unlikely to be incurred. Thank you to Iain Davidson-Hunt and Helen Jensen for covering project costs, as well as to project partners for contributing their time and expertise!

Resource and Cost Estimates

Resource Group	Item	Source (Default, Iain Davidson-Hunt)	Cost (CAD)
Labour	Murray Jowett		7000
Data and Multimedia collection	Participant honoraria (\$200 each)	Bauta OFRF budget	2000
Translation for Quebec case (Likely)	Outreach document translation		825.14
	Interview translation		273.75
	Interview transcription		110
	Translation of transcription		1088.32
Total			11297.21

Cost Estimate Descriptions

Labour cost - \$7000:

The cost of my work on this project is \$7000, based on the student stipend provided by Iain Davidson-Hunt at the Natural Resources Institute, and a projected 8 months to completion beginning January 1, 2021. Additionally, and gratefully, I am assuming the project team will contribute their work as part of their current roles at related institutions.

Data and multimedia collection - \$2600 anticipated:

With respect, I anticipate participant farmers will contribute their time and knowledge to interviews and workshop sessions free of charge. There is a possibility that Helen Jensen's OFRF budget will allow honoraria for 10 interviews at \$200 each (total \$2000), but at this point it is not certain. The cost of translation services is also uncertain, but I have budgeted \$600 assuming there will be multiple French interviews and documents to translate into French. Helen indicated that Bauta is in contact with someone who may be able to do this work, but whether this service is

provided as part of their current role, or if it carries a cost still needs to be discussed. Camera equipment rental (\$150) is an unlikely expense, but I have made room for it to be safe. I will not be collecting data/multimedia, and even so, the Natural Resources Institute may have access to this equipment if it is needed.

Translation

To facilitate the inclusion of a mainly francophone participant in Quebec, services will be needed in the translation of outreach documents, interview translation, and transcription of interviews.

Resource Requirements & Procurement

This list details the resources (physical, digital, and human resources) that are or might be required to complete the project. It draws from the Responsibility Assignment Matrix, Skills Inventory, and the 'Materials, Supplies and Equipment' list, all of which can be found in the appendices. See 'Budget Summary' for total costs beyond resource requirements.

Task	Materials Needed	Quantity	Available/Procure	Approximate Cost
Data/multimedia collection	French translator and transcriber	1	In-house NRI / Procure	\$2297.21
"	Qualitative research skills	n/a	Available through project manager by means of Qualitative Methods course	nil
Total				\$2297.21

Skills and Knowledge Acquisition Plan

This plan identifies the specific skills and knowledge required to complete the project and how they will be acquired. Like the Resource Requirements chart, it draws on the Responsibility Assignment Matrix and Skills Inventory, both of which can be found in the appendices. The main skills required relate to collection and reporting on data.

Interviews

Qualitative data collection skills are required to design and carry out the interviews. I acquired familiarity with these skills through a Qualitative Methods course in 2019 in which we studied a variety of data collection methods, practiced interview design, interviewing, and participant observation. I also carried out interviews for an undergraduate project on urban agriculture and Food Sovereignty in 2016.

Reports and Narratives

Writing skills as well as experience generating reports will be required to communicate the findings of the interviews. These skills will be needed both for writing in a narrative format for the map, but also in developing summaries and reports. The Qualitative Methods course gave me some experience reporting on data, and years writing for university assignments has given me a general comfort with writing. For the MNRM masters program I also created position papers which were helpful in learning how to write in a practical reporting format.

I will need to learn to write in a narrative format for the map content, which I plan on doing by looking for examples, agreeing on style with the project team and emulating that style. I have scheduled periodic check-ins with the project team during narrative development so that points of style and approach can be refined as I progress.

Risk Management Plan

Attention has been paid to the various elements of risk posed both to this project and by this project. Close revision of deliverables, requirements, and project activities, as well as communication with the project team has pointed to several points at which risk needs to be considered and addressed. A Risk Register (see appendix) was created of all project risks and through a Probability and Impact Matrix (see appendix) the risks most critical to project success were identified. The following risk response plan addresses the four main risks of the project.

Risk Responses Chart

Risk #	Risk	Response	Details
1	Finding out about value chains that contravene regulations	Mitigate	This risk will be mitigated in two ways. First, the project must follow university ethics guidelines that ensure risk reduction/elimination to study participants. Second, we have decided to create 'composite' value chains – generalized descriptions of chains which can incorporate and discuss elements of 'non-regulatory' value chains without explicitly naming those involved in these practices. These mitigation approaches are described in the project charter.

2	Accidentally disclosing sensitive information about farmers and value chain participants	Avoid	This risk can be avoided through consistent communication and member-checking with participants. There should be no surprises for participants in the project deliverables and they will have ample opportunity for review and questions. This approach is also outlined in the relationship management plan. If sensitive information is somehow disclosed in project deliverables, the deliverables can always be edited to leave out this information.
3	Project goes beyond August adjudication date	Avoid	Adhering to the general timeline and continuing to make the work breakdown structure more specific will be sufficient to avoid this risk. This approach seeks to accurately estimate timeframes, time limits, and dependencies. It also builds in opportunities to compensate for delays. It is necessary to meet the August deadline because the next NRI practicum adjudication period would be six months later – a frustrating delay.
4	Low interest or unwillingness to participate from value chain participants	Accept, Transfer	We do not know the nature and composition of PPB value chains, that is why this research is necessary. It is therefore difficult to predict how value chain actors will receive invitations to participate in the study. If we are to accept this risk, a response option would be to expand the total number of value chains studied, thus covering a greater number of small chains. Communicating with project partners to investigate more effective means of recruitment is another possible response.

Quality Management Plan

This section ensures that project requirements are met, and met to a defined standard. Quality Criteria are largely borrowed from the requirements section of the Charter with a few additions, whereas Quality Management Procedures are the steps that will be taken to meet those requirements and address risks to Quality. Procedures also details how input and vetting from the Project Team will be managed and responded to. Checklists such as the Milestone Chart, Activity List, and Project Schedule will be updated to make sure quality management activities are completed on time.

Quality Standards and Regulations

There are no external quality standards and regulations for this project. I simply commit to delivering a high-quality practicum project.

Quality Criteria

1. Project must be completed by August 2021
2. Project must be completed on-budget.
3. Project must meet the deliverable requirements set out in the Charter

Most Significant Risks to Quality

The following risks to quality are addressed in section 'b' of Quality Management Procedures.

1. Language barrier with Québec farmers and value chain actors
2. Diversity of region and market orientation amongst case studies
3. Quality and effectiveness of value chain discovery narratives and multimedia
4. Structure and approach to the creation of 'composite' value chains

Quality Management Procedures

Some procedures are undertaken on a regular basis to monitor and maintain quality, while other steps are taken to ensure quality at specific points during project completion. These steps, as well as the procedures for incorporating the results of quality checks and project team vetting are listed below.

- a. Regular procedures to ensure quality work is done on an ongoing basis.
 - i. I will update the Activity List and Milestone Chart which have been created in accordance with the quality criteria detailed above. These checklists of project activities makes sure that all steps are taken to meet quality criteria on schedule and that participants and project partners have a chance to vet quality as the project progresses.
 - ii. I will ensure quality by charting my progress weekly in the project schedule which contains all milestones and elements of the Work Breakdown Structure. Please refer to the “% of task complete” column of the schedule to see task status.
 - iii. The Relationship Management Plan also details the processes of communication necessary to completing the project according to quality requirements.
 - iv. I will review requirements before beginning deliverable tasks to ensure deliverables are completed according to quality requirements.
- b. Addressing significant risks to quality and ensuring quality is monitored at critical stages of the project.
 - i. A translator will be recruited to ensure clear communication and results from interviews with Francophone study participants. The Bauta Initiative has used translation services for this purpose in the past and has connections with people who can do this work.
 - ii. To ensure diversity of region and market orientation amongst case studies, case selection will be carried out with Helen and the project team. They are the connection with study participants and will therefore be directly involved in decisions regarding regional and market representation. If the project manager and project team agree that diversity potential has been reached, that will suffice.
 - iii. The constitution of ‘high quality’ and ‘effective’ participant narratives and multimedia is highly subjective. To achieve agreement on the style and quality of these elements I will search for various examples of narrative styles that could be applied to this project. I will review these examples with the project team to agree on a style approach. After that point, I will periodically submit draft iterations to solicit advice and make sure that consistent expectations of style are met.
 - iv. Examples of composite value chains have yet to be discussed. The purpose of this approach is listed in deliverable requirements and quality criteria, forming a loose basis for the qualities of these composites. As

data collection progresses, I will begin work on composite chain prototypes which can again be shared and adapted iteratively with the project team and participants.

- c. Responding to quality checks and monitoring results
 - i. I will prioritize project areas in which regular monitoring suggests quality slippage, especially for schedule issues. If for any reason it becomes difficult to meet quality needs, I will first discuss this with Iain Davidson-Hunt and then the project team if necessary, to consider adaptations.
 - ii. I intend to respond promptly to vetting, suggestions, and edits with a spirit of accommodation, based on an interest in improving the project. If revisions arrive too late or may somehow compromise the goals or core elements of the project such as budget, schedule, scope, risk, and quality, I will communicate this to the project team. This will give them a chance to reconsider or reiterate their advice.

Quality Management Roles and Responsibilities

I take full responsibility for quality management barring three exceptions:

1. Vetting and review: I will take all steps to ensure quality, but it is also the responsibility of the project team and participants to identify and alert me to issues of accuracy and sensitive information disclosure.

Approvals

Email communication and two online meetings with the project team are the basis of approval for the development of quality management procedures thus-far. These meetings and emails provided a chance to develop requirements that meet the standards of the Project Team.

Communications Plan

This communications plan details all the communication required to execute the project. It has two components – the Communications Plan and the Relationship Management Plan. The Communications Plan deals with the outward communications needed to communicate the deliverables and the results of the project. It is used primarily to disperse the map and results of the value chain discovery. The Relationship Management Plan charts all the internal communication that is necessary for project completion, including the mechanism used for this communication. Some of these items are discreet tasks that are also present in the Work Breakdown Structure (WBS) while others are more consistent lines of communication. WBS numbers are listed where necessary. A more detailed list of interested parties can be found in the Interested Parties Register.

What is a Communications Plan meant to achieve?

A communications plan is needed to communicate project results to audiences outside of those who are directly involved in project delivery. The project team, case study candidates, and value chain interview participants are all involved in the task of completing project deliverables. A communications plan addresses actors beyond this group.

Intended Audience(s)

For the scope of my work, there are five general categories of actors addressed by my communications plan.

- 1) New PPB farmers
- 2) PPB farmers with developed populations but undeveloped value chains
- 3) PPB farmers who have begun value chain development but were not covered in the study.
- 4) Potential and current PPB value chain actors as defined and invited by PPB producers.
- 5) PPB advocates, practitioners, and proponents who are connected to or involved in the work of the Bauta Initiative and UMPPB. This audience is determined by the individuals on the project team.

Key Messages

The key message to the intended audience is that it is possible to, and it makes sense to develop value chains from PPB populations both from an economic and ethical standpoint. There is a community of farmers and value chain participants who have proven the viability of PPB value chains and can serve as a guide for those looking to get involved. We are asking this audience to:

- Increase their understanding of PPB as an economically, socially, and environmentally beneficial breeding practice

Suggested Communication Vehicles

For intended audiences 1, 2, and 3 (participant producers) I am hoping that project partners will be willing to share their contact lists, email lists, and/or participant databases for communicating key messages.

For intended audience 4, I hope study participants and broader PPB participants will be willing to invite or share with their relevant networks of producers and value chain partners. A request email should be sent through the previously mentioned contact lists, email lists, and participant databases, explaining the need to disperse project results and requesting that they reach out to their respective networks. This request can be accompanied by a form letter directed to audience 4, including an introduction to PPB and slide deck.

Audience 5 is determined by the individuals on the project team and can also be gathered from the broader communication networks of the Bauta and UMPPB programs. Once again, I hope the project team will complete their own communication to this audience, though I will be happy to spearhead this communication if the appropriate contact is provided. In that case I would send another form letter like that directed to audience 4.

Timing in relation to project stage or activities:

Should begin as soon as the map is developed.

Relationship Management

Interested Party (WBS #)	Mechanism or activity	Purposes	Timing	Responsibility
Project Team	Email, group email, virtual meetings. This variety allows flexibility depending on the needs of communication for the various purposes of meeting. *This is the standard means of communication with project team	Review project development, get feedback, get advice, confirm official progression	This communication is consistent through the project	Murray

Helen/Aabir	Email project plan and request draft project plan meeting	Discuss what is needed for the project plan to move to committee. Obtain signoff on draft meeting	After completion of project plan	Murray
Committee	Email reviewed project plan	Request committee approval	After draft project plan meeting	Murray
2.1.3.1 Potential Study Participants	Email	Preliminary investigations for scoping, gauging interest and developing interview questions.	Immediately	Murray
2.2.1 Project team	Send interview format and questions for review and confirmation	Make sure interviews are appropriate and effective for our collective purposes	Early stages of project execution, must be complete before interviews begin.	Murray
2.3.1.1 Case study farmers	Send project description along with endorsement from Bauta *Individual email will be the standard means of communication with farmer participants and value chain participants	To inform case study candidates of what I intend to do, how I intend to do it, and request their participation. Ask if they would be able to do virtual meetings or phone calls.	After approval of project plan	Murray
2.3.1.1 Case Study Value Chain Participants	Same as above	Same as above	After identity is revealed by case study farmers	Murray
2.3.1.2 Case Study Farmers	Schedule interview.	To be able to collect data and multimedia	After Farmers agree to participate	Murray

2.3.1.2 Case Study Value Chain Participants	Same as above	Same as above	After identity is revealed by case study farmers	Murray
2.3.1.3 Case Study Farmers	Send interview prep (Including questions and the type of information we are seeking)	To prepare interview participants and make sure they have relevant information available. Ex: List of customers/vendors for continued value chain discovery.	After farmers agree to participate	Murray
2.3.1.3 Case Study Value Chain Participants	Same as above	Same as above	After identity is revealed by case study farmers	Murray
2.3.2 Case study farmers and value chain participants	Virtual interviews. Covid 19 is further restricting travel and it is unwise to have in-person contact.	Gather data, gather multimedia (likely multimedia generated by participants)	As soon as possible after project plan approval and after value chain participant identities are revealed by case study farmers	Murray
2.4.5 Project team, case study farmers and value chain participants	Email draft reports for feedback	Make sure information is accurate, safe and meets project requirements	Upon initial data gathering and narrative development	Murray
2.5 Project team	Share and confirm results	Confirm content	After completion of writing	Murray
3.3.1 Project team	Email deliverables for review as they progress	Make sure requirements are met	As deliverables are developed	Murray
3.5.1 Case study farmers and participants	Email results and final deliverables to participants	Approval or any major objections (hopefully any reservations are expressed in the earlier review process)	After deliverables are complete	Murray

Project Schedule

The following Gantt chart is an aspirational project schedule. It was a live online document containing all the tasks, activities and milestones that lead to project completion. It assigns these tasks and allows for the tracking of task progress through the column labeled ‘% of task complete’. The progress tracking column is programmed to use gradient shades of green to indicate task progress – dark being more complete, and light being less complete.

The schedule depicts the chronology of tasks visually with time progressing from left to right. Increments of ½ week have been selected because depicting each day individually would take too much space, but full-week increments do not allow for finer timing details. Items related to the overall practicum process occur throughout the project and are indicated in purple. Deliverable #1 is teal, deliverable #2 is red and deliverable #3 is yellow, and milestones are indicated with yellow highlight. Critical Path Tasks are also denoted in bold and have black lines surrounding them in the schedule. These are tasks with no float time, so deviation from the scheduled completion of these tasks changes the timing for the entire project.

Tasks may be added or altered, but any changes that appear important or relevant to the project team will be communicated, especially those concerning time-sensitive tasks. The schedule is a result of the Critical Path Chart, Milestones Chart, and Activity List which can all be found in appendices.

The following two pages show the project schedule current as of Feb 5, 2021. They are intended to provide a snapshot of how the schedule appears. The pages are split to accommodate the whole schedule, but the active schedule was in one cohesive spreadsheet.

Murray Jowett

February 5, 2021

 Denotes critical path task

[illegible]

Project Schedule

Value Chain Discovery of Canadian Participatory Plant Breeders	Natural Resources Institute
Murray Jowett	February 5, 2021

	Denotes a practicum process task or event
	Denotes critical path task
	Denotes milestone

[illegible]

Change Management Plan

Requests for change may come from external influences, from project partners, or from the project manager. It is important to have a process for making decisions related to change and ensuring that change improves the project to the greatest extent possible. The following change management plan details decision making processes around change, including accepting or denying requests, mitigation and management, and monitoring.

The first step in this process is deciding whether to accept a proposed change – assuming there is some degree of control and that the change has not already happened. The project plan and project charter lay out the scope and intention of the project and will therefore be used to assess if a proposed change is within the scope of the project. I intend to approach requests for change with a spirit of accommodation, especially when time permits. Nonetheless, I reserve the right to not take on work beyond the scope set out in the project plan and agreements made with the project team.

Changes should not affect the capacity of the project to meet its goals and objectives. More consideration is due for changes that will affect core elements such as budget, schedule, scope, quality and risk. A change in one of these elements will likely result in a change to all of them. An assessment of change should review these elements to understand which changes must be made as a consequence. An assessment will also seek to understand the reason a change is needed and seek alternatives that do not alter core project elements.

Especially concerning core elements, I will err towards communicating changes to the necessary parties. Anything that deviates from the planning documents and affects the overall success or direction of the project will be communicated to the project team to seek responses. When possible, I will limit communication regarding change to only necessary parties.

The effects of changes can be monitored through weekly progress updates in the project schedule, and I will maintain a record of changes through emails, a meeting log, and a change log. (See appendices) The meeting log contains a general record of discussions with the project team and will be made available to the project team. The change log specifically documents change processes, the basis of decision making, and consideration of options in accepting and responding to changes.

Chapter 2: Project Deliverables

Deliverable 1: Critical Issues Identification Report

Background and Critical Issues Identification Report

The following background report constitutes deliverable 1 of the project plan. It identifies critical issues in the development of Participatory Plant Breeding (PPB) and PPB value chains and provides background information for the project plan. It introduces the key characteristics and purposes of PPB and elaborates on the practice of PPB in Europe and North America, largely in organic systems. The report then shifts to socio-economic elements of PPB research, introducing the concept of value chain and its importance for understanding market dynamics. The final piece describes PPB practice in Canada, mainly through the work of the University of Manitoba Participatory Plant Breeding Program (UMPPB). It unpacks the regulatory and institutional context of PPB in Canada, elaborating specifically on the partnership between UMPPB and the Bauta Family Initiative on Canadian Seed Security – the two organizations comprising the project team of the proposed project.

The subsequent sections describe how this project was developed and how it will be carried out. The features of the proposed project were refined through several meetings with the project team. The project addresses specific challenges faced by UMPPB first by identifying issues and developing goals in response to these issues. Objectives were created to meet these goals and a series of project deliverables were conceived to carry out the objectives. The key methods for completing the project and gathering information are based in semi-structured interviews and employ a snowballing approach, also known as ‘walking the chain’, to reveal value chain actors.

PARTICIPATORY PLANT BREEDING OVERVIEW

Participatory Plant Breeding (PPB) restores the role of the farmer in the crop breeding process through collaboration with researchers. In this process, PPB farmers play a key role in initial trait selection. They continue to select for desirable traits while crops adapt over multiple seasons in their fields, until they eventually scale up production. PPB has proven to be effective both in enhancing biodiversity and developing crops that are adapted to their unique growing conditions. (Murphy, Lammer, Lyon, Carter, & Jones, 2005)

Participation ensures population development is relevant to farmers needs, (Vernooy 2003) developing varieties adapted to both their physical and socio-economic environment. It can result in improved agronomic performance in marginal conditions, the development of qualities that meet farmer and consumer preferences, and farmer control of genetic licensing.

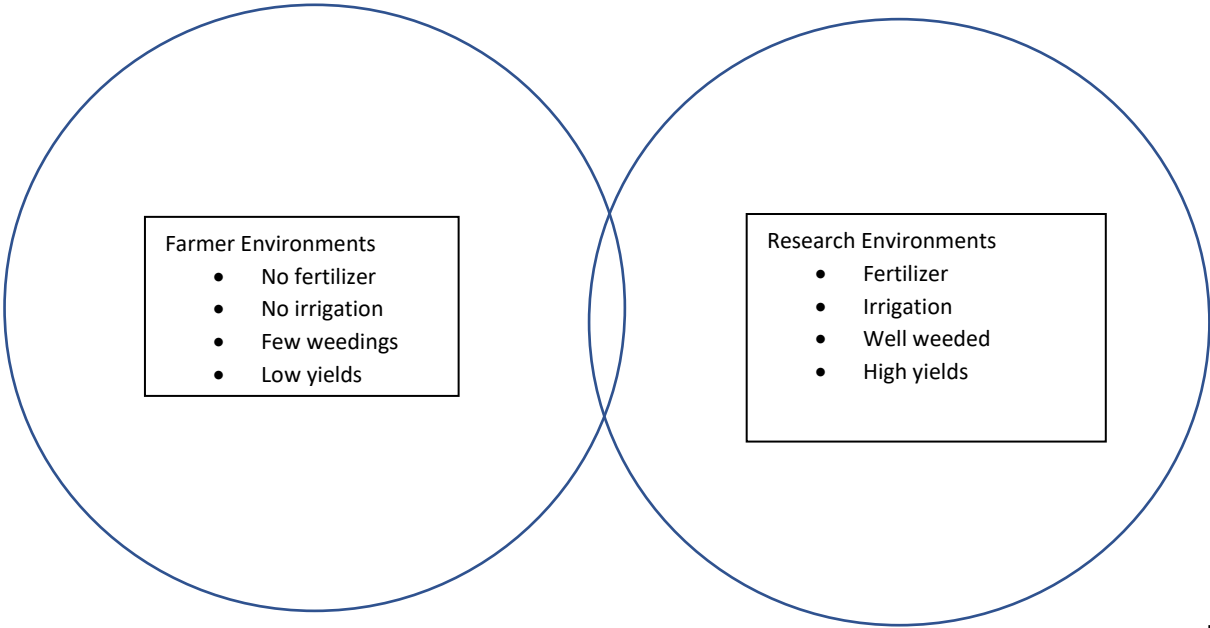
There are multiple approaches to PPB that involve a variety of activities and actors, but at its most basic, PPB is a collaboration between researchers and farmers. Participants can include processors, consumers, extension staff, and even NGOs – but farmer

participation is essential. PPB programs differ in the levels of involvement and decision making and see many different forms of interaction between stakeholders, farmers, and breeders. This complexity led Witcombe et al. (2005) to describe PPB as a continuum of activities that can be seen as “highly client-oriented” plant breeding.

Figure 1, adapted from Witcombe et al. (2005), depicts the merging of farm and researcher environment that occurs in PPB. Standard breeding practice is directed toward crops that will be grown in fields that are heavily conditioned and controlled by non-organic chemical inputs. Conventional breeds are not only grown in these idealized conditions, they are also developed and tested in these conditions and therefore adapted to thrive in these conditions.

A farmer’s environment, especially that of an organic farmer will present different conditions than the idealized test conditions of a research station. This creates a disconnect between the conditions in which a cultivar was tested and the actual environment it is grown in. Often the result is agronomic underperformance, especially when genetic plasticity has been limited and a cultivar does not have the ability to adapt to its conditions. (Murphy et al., 2005; Wolfe et al., 2008) Merging the two environments – that is, developing a variety where it will eventually be grown – sees breeding and growing conditions align. This can lead to improved performance of cultivars in organic and low-input conditions. (Dawson, Murphy, & Jones, 2008; Entz, Kirk, Carkner, Vaisman, & Fox, 2018) The following diagram depicts the merging of these two environments:

Conventional Breeding Program

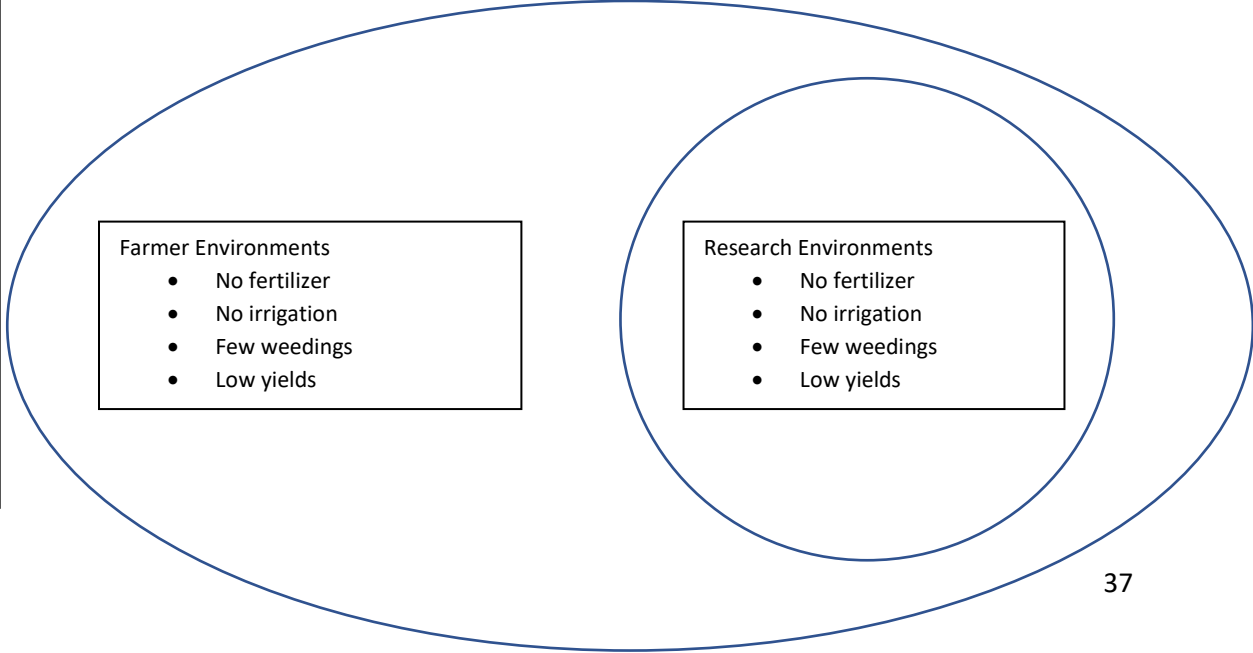


Participatory Breeding Program

Figure 1: The merging of farmer and researcher environment that occurs in PPB.

Farmer and research environments are not always this divergent, but the example illustrates the disconnects between farm and research environments in traditional breeding programs.

Adapted from Witcombe et al. (2005)



The Potential of PPB

Humanity's relationship with seeds is at the heart of agricultural sustainability and struggles for autonomy. (Chiffoleau & Desclaux, 2006; Ortolani, Bocci, Bàrberi, Howlett, & Chable, 2017) Beyond the immediate agronomic benefits of PPB, there are social and environmental reasons farmers might choose to participate.

Socially, farmers are empowered in this process by building skills and capacity in a field that they have largely been pushed out of. (Dawson & Goldberger, 2008) PPB constitutes a repossession and localization of capacity for farming communities. They are empowered to increase local biodiversity, make choices about seed management, and reduce institutional dependence. (Ceccarelli and Grando 2019; Kloppenburg 2010).

This re-localization can strengthen communities through the development of collective structures (Chable, Dawson, Bocci, & Goldringer, 2014) and other decommodified exchange networks required to organize PPB activities. (Da Vià, 2015) Communities are also empowered to breed crops with local relevance or terroir, defining a sense of 'place' in food systems and increasing farmer income by adding value to their product. (Brouwer, Murphy, & Jones, 2016; Chable et al., 2014; Vernooy, 2003) In this way, shifting the "locus" of breeding (Witcombe et al., 2005) to the local level augments the capacity for resilient self-provisioning and in many ways enables the place-based or regional agricultures envisioned by food movements. (Dawson et al., 2008)

PPB can also contribute to agricultural sustainability by "maximizing the adaptive capacity of plants" (Chiffoleau & Desclaux, 2006) which increases on-farm biodiversity. This contributes to the diversification of genetic resources, especially in the context of an industrial agriculture that tends toward fewer crops spread over a large area (Cleveland, Soleri, & Smith, 1994). Along with this benefit, crops can be bred to be less resource intensive and have demonstrated resilience and adaptability to climate change. (Ceccarelli et al. 2010)

Origins and Application in Organic Systems

PPB originated with smallholder farmers in poor and arid countries such as Egypt, Algeria, Eritrea, and Syria where it demonstrated social and agronomic improvements (Ceccarelli, Grando, and Baum 2007; Ceccarelli and Grando 2019) Many of these farmers grow in high-stress conditions – often very hot and dry, and on marginal land. Their soil conditions are often heterogeneous, meaning soil quality and nutrients are not uniformly distributed, and they lack the money for chemical inputs to condition their soil. This, in addition to farmers' lack of integration in the market economy makes their context unattractive for conventional breeders. (Almekinders and Elings 2001)

Organic and low-input systems share some of the features of PPB's formative setting. This is why in wealthier industrialized countries (largely in Europe and North America) PPB has found application in organic and low-input systems. Like the original context of PPB, organic agriculture (OA) is often practiced on marginal and heterogeneous land and does not use synthetic inputs to condition or homogenize the soil. OA also does not use synthetic herbicides and pesticides. (Shelton & Tracy, 2016) These conditions mean that OA cannot rely on synthetics to compete with weeds and pests or to deal with the uneven dispersal of nutrients across the fields. In this case, traits like weed competitiveness, disease resistance, and effective root systems (Bauta Family Initiative on Canadian Seed Security, n.d.-a) become important features of varieties used in OA, and PPB can help develop these traits.

OA has unique conditions and requirements and is not easily served by centralized seed-breeding companies, primarily because the organic market is too small to justify investment. (Dawson et al., 2011) OA and low-input systems are often accompanied by a complex level of on-farm integration not seen in most industrial systems (Van Bueren et al., 2011) as well as close relationships between farmers processors and consumers. (Chiffoleau & Desclaux, 2006) PPB assumes that farmers will have superior knowledge of their own farm and market dynamics and therefore be in the best position to make beneficial breeding choices. PPB also facilitates the pursuit of specific quality characteristics, and this can help meet the unique market demands of OA. (Dawson & Goldberger, 2008) OA may serve specialty or quality markets, for example, that look for characteristics that are not met by most cultivars that stock supermarket shelves.

Despite the underperformance of conventional varieties in organic and low-input systems, Van Bueren et al. (2011) estimate that 95% of organic agriculture uses seed that is not developed for organic conditions. Testing has demonstrated increased productivity using PPB adapted crops in OA and low-input systems as well as the ability to quickly adapt desirable quality characteristics. (A. P. Kirk, Vaisman, Martens, & Entz, 2015; Witcombe et al., 2005)

PPB AND VALUE CHAIN

Value chain investigation is a vehicle for learning about the qualitative aspects of PPB as well as a means for assessing the development of PPB value chains. The limitations to PPB are not technical but social, economic, and institutional. For this reason, researchers have expressed a need for socio-economic research at the level of markets and supply chains, and value chain investigation can meet this need. Value chain investigation can increase the effectiveness of participatory networks and unearth the multidimensional values that drive participation, ensuring that the potential of this promising innovation is fulfilled.

Research Needs and Value Chain

Researchers and practitioners have identified a need for the qualitative, contextual, and socio-economic investigation of PPB. This addresses a general sense that breeder-farmer interactions are too often limited to technical discussions about breeding and lack critical communications about goal setting and the nature of participation (Sperling, Ashby, Smith, Weltzien, & McGuire, 2001; Weltzien, Smith, Meitzner, & Sperling, 2003) Ceccarelli and Grando (2019) also noted that “there are no obvious technical restrictions limiting PPB.” If this is so, the barriers to PPB are social, economic, and paradigmatic, and they require qualitative investigation.

More specifically, there is demand for information gathering at the level of markets (Sperling et al., 2001) and supply chains. (Van Bueren et al., 2011) Indeed, Chiffoleau and Desclaux (2006) note that multidisciplinary research involving all the stakeholders in supply chains is necessary to “organize the production and exploitation of coproduced seeds”. This step ensures that PPB projects are relevant to all involved, and that its potential is maximized.

Value chain study encompasses the aforementioned range of socio-economic dynamics and actors. Kaplinsky and Morris (2000) define value chain as:

“the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use.”

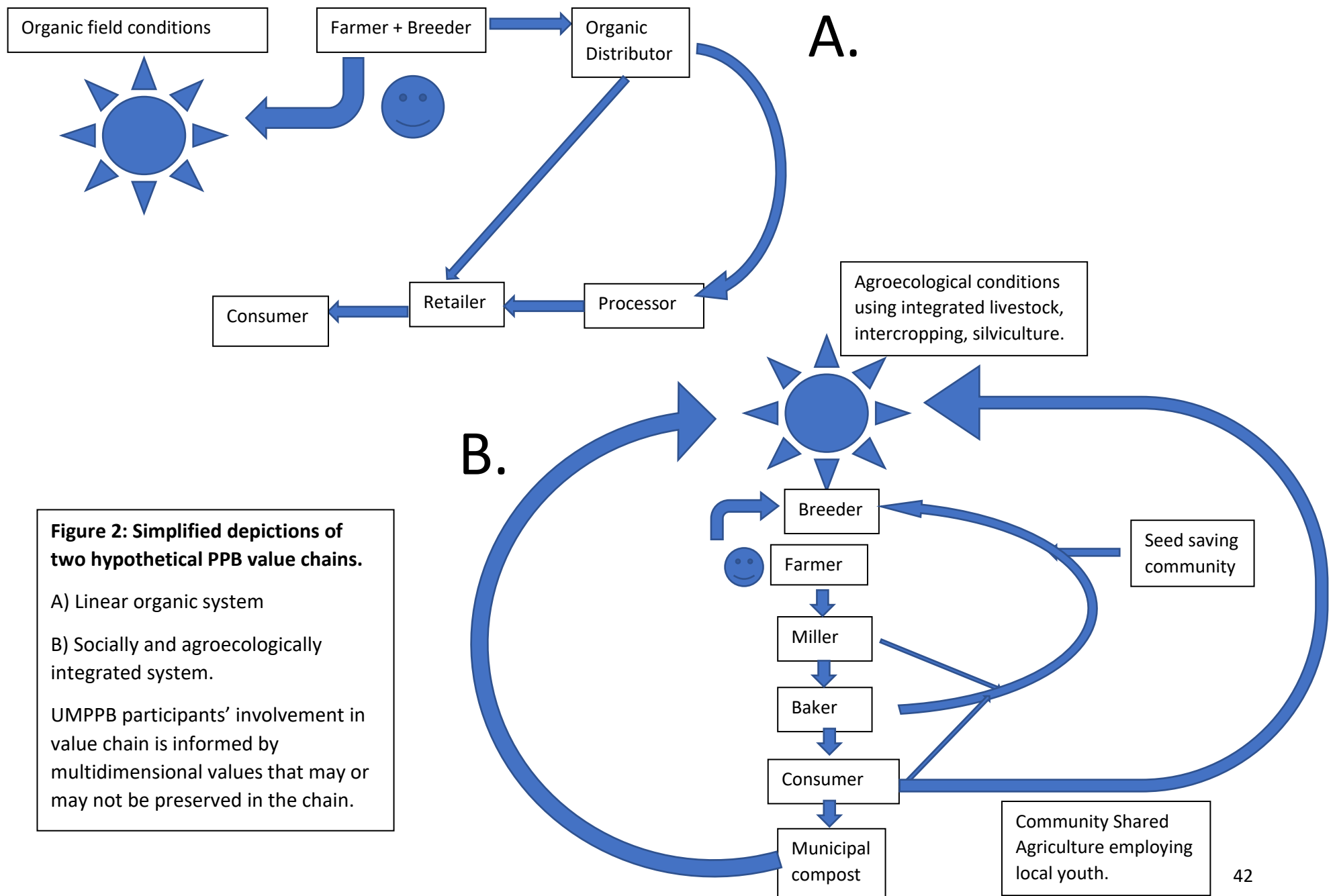
It is important that PPB value chains are developed, as value chain is the ecosystem in which agricultural products are embedded. Value chain development allows PPB farmers to find a market for their populations, disperse the results of their hard work, and see financial returns. It is also important for allowing PPB to reach its social and ecological potential. By creating viable value chains, PPB can demonstrate alternatives to an environmentally ambivalent and heavily centralized breeding system.

Value Chain Development

PPB can invite the participation of diverse value chain actors including local processors and marketers and provide opportunities for unique collaborations and local procurement. (Casals, Rull, Segarra, Schober, & Simó, 2019) PPB value chains in the United States and Europe have included millers, bakers, chefs, and pasta manufacturers (Brouwer et al., 2016; Chiffoleau & Desclaux, 2006; Healy & Dawson, 2019). This process democratizes decision making about what plants are introduced into a food system (Ceccarelli, Guimaraes, and Weltzien 2009) and facilitates value retention in regional economies and locally embedded food chains. (Van Bueren, Struik, van Eekeren, & Nuijten, 2018; Westengen & Winge, 2019)

Value chain investigation can make participatory networks more effective and intentional by identifying vectors and barriers to chain development. (Fearne, Garcia Martinez, & Dent, 2012) This kind of investigation can bring forward information regarding why and how a product is successful and influence a producer's decisions regarding what to grow. It also gives a chance for chain participants to identify the difficulties they face in developing markets, especially from a policy and regulatory perspective. Revealing this information allows program managers to answer questions such as "who has the power to change things" (McCormick & Schmitz, 2001) and direct programming accordingly.

PPB practice is often imbued with ecological and social values, and qualitative value chain investigation can determine if the values informing participation are preserved in the chain. This kind of research allows values to come into focus (Fearne et al., 2012), making it possible to examine the values-related features of the chain. Asking who participates in the value chain, also why and how they participate, is directly relevant to UMPPB farmers and should inform the design and progress of any PPB program. (See following diagram).



PPB IN CANADA

There is one program offering PPB for field crops in Canada – the University of Manitoba Participatory Plant Breeding Program (UMPPB) led by Dr. Martin Entz. UMPPB exists in a complex regulatory environment of organic requirements and varietal registration procedures. It is supported by several institutions, but the main funding and project delivery partner is the Bauta Family Initiative on Canadian Seed Security. Dr. Entz and representatives from the Bauta Initiative comprise the project team for this proposed project

The University of Manitoba Participatory Plant Breeding Program (UMPPB) and the UMPPB Process

UMPPB has been working for ten years with organic and agro-ecological producers across Canada with the goal of restoring farmer control of seed and the development of cultivars that are relevant to their needs and environmental conditions. (“Participatory Plant Breeding for Canadian Organic Crop Production,” 2016) UMPPB has engaged over 100 farmers since its inception, producing populations of oat, wheat, potato, and – in the early stages – corn. It has moved PPB research forward, demonstrating its potential to increase yield in organic conditions (Thiessen Martens, Entz, & Wonneck, 2015) as well as the potential to increase nutritional content in some cases.(A. P. Kirk et al., 2015)

The UMPPB method differs between oats, wheat, and potato, but they go through similar steps. Farmers select from ‘parent varieties’ that have traits the farmer is interested in developing. For example, if one variety of wheat has particularly good flavour, and another has strong resistance to rust, farmers may be interested in cross breeding these two parents to create a variety that has both traits. The university and its partners painstakingly make the crosses and distribute the results to be grown in the farmers’ test plots. (“How Does a Participatory Plant Breeding Program Work?,” n.d.)

From this initial crop, the farmers select seeds from desirable plants and use these seeds to grow the same crop the next season. They do this for two more seasons, at which point the crop has hopefully adapted to its conditions and started to display the desired traits. After three years of selection, the final step is to increase the amount of the resulting seed/crop and develop markets.(A. Kirk, 2014) This is also the first step toward developing value chains, and by the end of the process, farmers hold the license for their populations.

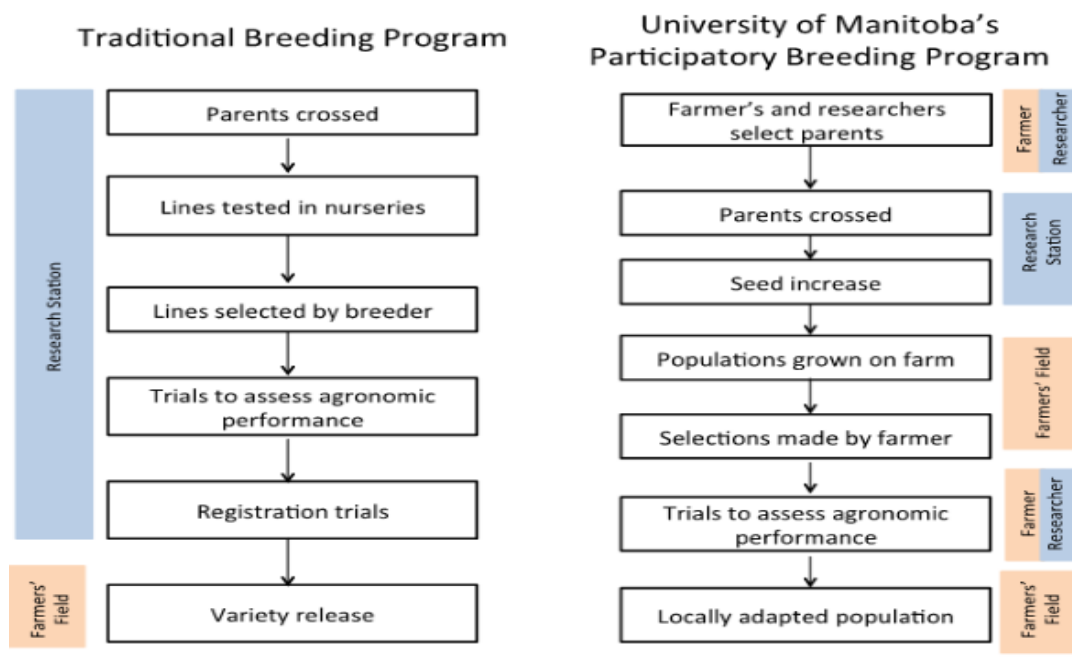


Figure 3: Comparison of traditional breeding practices and the University of Manitoba's Participatory Breeding Program.

Taken from the University of Manitoba Natural Systems Agriculture Department website, 2015. Retrieved November 9, 2020.

http://www.umanitoba.ca/outreach/naturalagriculture/articles/ppb_project.html. Copyright 2015, University of Manitoba Natural Systems Agriculture.

UMPPB in Context

UMPPB is part of a coordinated effort to build the organic sector, which includes participation in the multi-sector research collaboration 'Organic Science Cluster III' – funded by Agriculture and Agri-Food Canada. This research addresses the OSCIII goal of producing crops for unique socio-economic conditions in addition to unique field conditions (Bauta Family Initiative on Canadian Seed Security, n.d.-b; "Organic Science Cluster III," n.d.).

Organic production in Canada requires organic seed which is often difficult to procure. PPB can be helpful in this situation by increasing varieties adapted to organic conditions. (USC Canada, 2014) Organic farmers frequently rely on derogations or an exemption from the organic seed requirement, often citing a need for specific varieties that are not available from the organic catalogue. As UMPPB breeds potatoes and wheat, and as two of the most common derogations are potatoes and wheat, (Levert, 2014) UMPPB meets two needs. It breeds specific varieties for two of the most derogated crops.

PPB populations in Canada can enter the challenging varietal registration process to be bought and sold as registered organic seed, or they can enter informal and closed loop markets. Unregistered varieties are informally traded as seed, or they enter smaller markets as a commodity. These informal markets include farmers markets and direct marketing arrangements (Carkner, 2016) and at the same time, larger specialty distributors are being pursued. (Isaacs, 2019)

The Bauta Family Initiative on Canadian Seed Security and the Project Team

UMPPB is led in partnership with The Bauta Family Initiative on Canadian Seed Security. The Bauta Initiative is a major funder of UMPPB and fulfills a substantial management role. They act as a ‘public- facing’ component of the UMPPB program, providing extension work for participants, outreach, and policy advocacy. The Bauta Initiative supports a variety of programs and partnerships aimed at building a movement for resilient seed systems across Canada. Their programs deal with regional seed conservation, training and networking opportunities, and the creation of seed diversity through the Canadian Organic Vegetable Improvement Project and UMPPB.

The project team of the currently proposed project is comprised of members from the Bauta team along with Martin Entz of UMPPB. Dr. Helen Jensen is the National Research Program Manager for the Bauta Initiative and co-leads the UMPPB program with Dr. Entz. Helen is the professional partner for this project as well as an essential source of guidance, information, and connection to farmers. Dr. Entz leads the technical, academic, on-farm, and in-lab components of the program. He acts as the official member of the Faculty of Graduate Studies on the practicum committee and is also a resource for guidance and information.

The guest members of the project team and practicum committee are Iris Vaismann and Aabir Dey, who also work for the Bauta Initiative. Aabir is the director of the Bauta Initiative and Iris is the Prairie Regional Coordinator. They provide important perspectives on this work, consulting and informing at key points in the process and vetting project results to make sure they meet the needs and specifications of the Bauta Initiative.

*Aabir Dey became the official project partner at the “Review of Draft Deliverable” meeting on May 11, 2022 – taking over for Helen who remained on leave. Iris Vaismann has since left the BFICSS and thus the committee.

DEVELOPMENT OF THIS PROJECT

The project team has identified the need for value chain discovery in the UMPPB program. This need is based on a variety of challenges that the program faces in the area of market development. The following project goals, objectives, and their corresponding deliverables are a response to these challenges and were developed through several meetings and the various project plan documents.

UMPPB Challenges

Almekinders, Thiele, and Danial (2007) suggested that PPB should be linked to market opportunities at the inception of a project. UMPPB has developed many novel populations, yet their exploitation and market development remain limited. Some populations have entered quality trials for baking and milling. A handful have managed to scale up production and find markets, but information on these cases remains limited, dispersed, and uncommunicated. This means that examples of viable UMPPB value chains are not readily accessible, making it difficult to support the PPB policy argument and for potential participants to see how PPB can be beneficial in their context. For this reason, UMPPB has endeavoured to explore the end-uses of their products as they enter markets or are registered as official varieties and sold as seed.(Bauta Family Initiative on Canadian Seed Security, 2018)

Project Goals

UMPPB and the Bauta Initiative have a natural shared interest in seeing that PPB demonstrates and fulfils its potential as an alternative approach to plant breeding. Project team meetings have yielded agreement that value chain investigation is a desirable means of addressing and investigating this challenge. The broad goals of this value chain investigation are therefore to discover, organize, and communicate information about PPB value chains. Specifically, the project team sees the potential for this investigation to identify barriers to value chain development, strengthen the PPB policy argument, support the development of short/local food chains, and increase the desirability of participation by demonstrating relatable examples of successful market development.

Objectives

Based on this information, three objectives have been developed for this project. The first objective is to review the existing knowledge on PPB and value chains, and this background report fulfils that objective. Second, the project aims to discover the structure and qualitative characteristics of Canadian PPB value chains. Third, the project aims to communicate the results of objective 2 in a compelling way to the public and potential PPB value chain participants.

Deliverables

Project deliverables have been developed to meet the objectives. This background report is the first deliverable. The second is a value chain discovery of PPB seed and products from PPB participant producer through to final consumers. The third is an interactive online value chain map profiling PPB farmers and value chain participants. The project team has developed requirements for each deliverable which are included in the project charter. One notable requirement is that the investigation include a diversity of regions, crops, market orientations, and end-uses.

PROJECT EXECUTION AND METHODS

This section describes the methods that will be used to complete the project plan and deliverables. The main data collection tool employed in this study is semi-structured interviews. Through a process called snowballing or ‘walking the chain’, interviews allow the discovery of subsequent value chain participants. Interviews will also provide the content of the various value chain reports and are necessary for creating participant narratives.

Methodology

Broadly, the project will draw on exploratory case study methodology. This approach is commonly used to explore previously uninvestigated social phenomena (Streb, 2010) and therefore it is well-applied to the project objectives of discovering and describing UMPPB value chains. Flyvbjerg (2006) describes this approach as “learning” not “proving”, and this way it creates space to learn who UMPPB value chain actors are, what they think, and how they participate. It can be considered a first step toward further studies that may be able to make more generalizations, but for now, this research “proliferates rather than narrows.” (Stake, 2009) In other words, this is the unpacking of participants’ experiences – not a definitive statement about their experiences.

Validity will be ensured in this approach through the in-depth discovery and accurate presentation of participants’ experiences. Participants’ stories are considered valid unto themselves (Creswell & Creswell, 2017), so I will use a number of qualitative tools to ensure research validity. (Gagnon, 2010; Stake, 2009) I will employ established techniques of interview structure and delivery (Dunn, 2005) that keep participants on track yet still leave space for them to explore topics. For example, I will use open-ended questions to ensure that participants are not ‘led’ toward answers. I will also paraphrase participants often to confirm their responses and encourage further answers. Along with this interview approach, I will use ‘thick’ description (Creswell & Creswell, 2017) in my notes and reporting to develop a realistic sense of human encounter. Finally, I plan to practice ‘member checking’ by consulting participants on deliverables as they develop. Doing so makes sure the meaning of their statements is accurately portrayed and they are happy with the outcome.

Semi-Structured Interviews

Information will be gathered primarily using semi-structured interviews in a similar fashion to that outlined by Dunn (2005). This is a common approach to the gathering of qualitative information in value chains. (Kaplinsky & Morris, 2001; Soosay, Fearne, & Dent, 2012; Wang, Somogyi, & Charlebois, 2019) I intend to use rounds of semi-structured interviews to afford the flexibility to be able to follow up with previously interviewed participants as themes emerge and new questions and priorities are defined. Detailed note taking accompanied by in-field analysis will refine rounds of questions based on the information encountered in early interviews. This process will be essential for making sure further questions are relevant and appropriate given the direction of initial interviews.

The interview format will be developed with input from the project team. The structure of this instrument will model that of another instrument created by Iain Davidson-Hunt and used for research on Biocultural Design and Innovation in small scale food systems (Davidson-Hunt et al., 2017; Janzen, Robson, & Davidson-Hunt, 2017). Also influencing interview design will be the format and results of Iain Storosko's 2020 masters research at the University of Ottawa on Canadian PPB farmers.

Covid-19 has curtailed travel for participant observation, so to strengthen narrative accounts, interviews will need to yield observations beyond the substantive information provided by participants. Observations may include participants' general demeanour but can extend to their broad ontological orientations and beliefs surrounding their participation. For validity, questions must be crafted in a way that affords freedom of response from participants and does not 'lead' them. To further enhance validity and check my own influence in the study I will use member checking during data collection and analysis. This will help ensure that my observations or transcriptions have been accurate and not coloured significantly by personal bias.

An essential step of this investigation will be following the value chain to discover actors and stakeholders. This will be achieved by asking participants during interviews to identify other actors in the chain and then following these connections. (Figure 4) This is like the "snowballing" approach to focus groups employed by Cameron (2008) in which information from informants extends the network of informants. Soosay, Fearne, and Dent (2012) describe a similar approach as "walking the chain" to uncover the unknown structure of value chains.

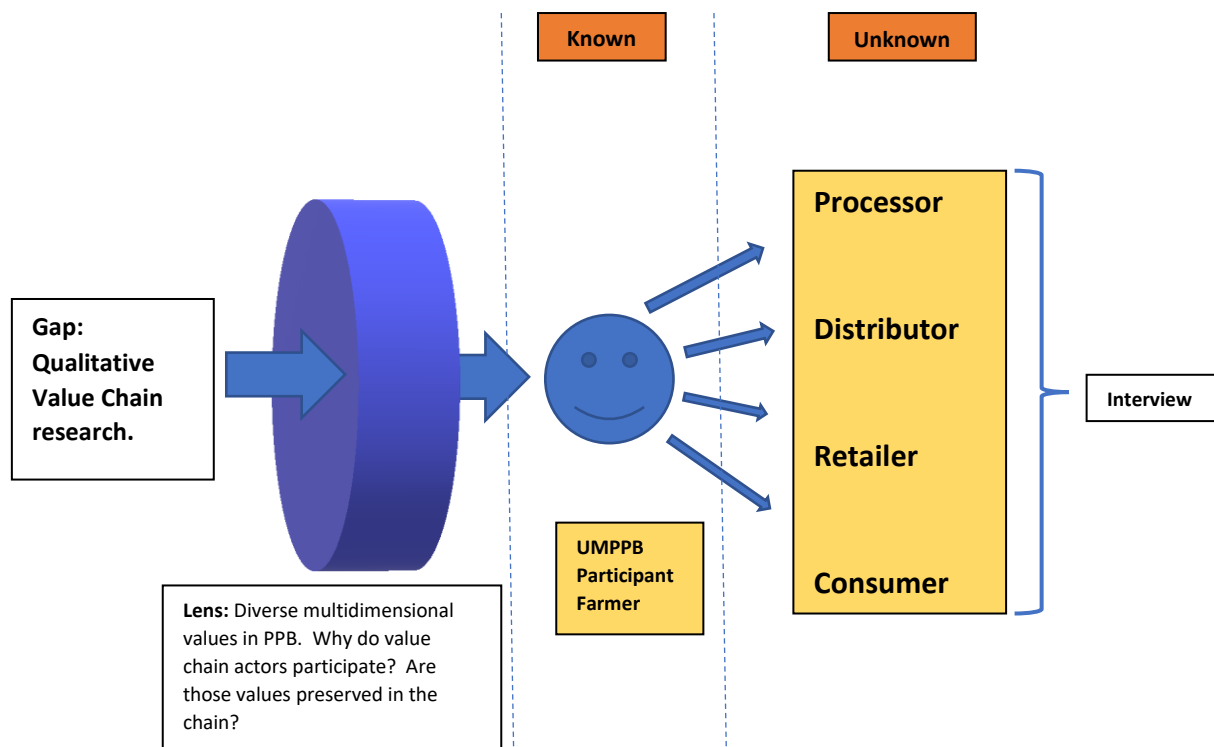


Figure 4: Research flow identifying the need for qualitative and value chain study in PPB.

I will be collecting biographical and narrative information about participants as well as their values and approach to value chain development. I will discover value chain actors initially through the farmer participant and gather data through semi-structured interviews.

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**Deliverable 2: Summary Report on the Commercialization of Participatory Plant Breeding in
Canada**

Executive Summary

This report contributes to the commercialization of Participatory Plant Breeding (PPB) in Canada. It describes the value chains of participants in the University of Manitoba Participatory Plant Breeding (UMPPB) program, which operates in conjunction with the Bauta Family Initiative on Canadian Seed Security (BFICSS). The report details the state of PPB commercialization, the orientation of farmers to this task, and some steps toward commercialization. It is the outcome of interviews with ten UMPPB farmers across Canada and is informed by background interviews with a seed breeder, a baker, and a Manitoban farmer-miller.

Section 1 identifies the structure of PPB participant value chains and the trends therein. Dynamics based on the market landscape of a region, proximity of farms to urban centers, and on/in-farm processing play a role in value chain shape, but the main value chain distinctions can be made based on scale. Assessing the characteristics of large versus small systems can be a first step in recognizing strategic commercialization pathways.

Farmer case study summaries are then included, painting a picture of the 'on-the-ground' diversity of PPB farmers, their markets, and their thoughts on PPB commercialization. They suggest commercialization approaches for each participant specifically and the program more broadly. Detailed case reports can be found as deliverable number two of the practicum document.

The overall status, intentions, and expectations for PPB commercialization were derived from these case studies, forming a summary of participants' experiences and progress. This chapter starts by detailing the state of commercialization, with some participants having more experience with PPB commercialization than others. Experiences at the forefront of PPB commercialization form the base of market development praxis for this program and should guide further development. This chapter becomes based more on participant speculation when moving into 'intentions and expectations', but these considerations are the foundation of further steps toward commercialization.

The report then becomes more theoretical or analytical, synthesizing information from participants that may be useful in framing the approach to PPB commercialization. There is a clear dynamic between quality, quality variability, and testing that governs the preparedness of farmers to move their populations to more concrete market development steps. Market development is highly communicative and highly relational - depending on cooperation and collaboration in many forms, as well as the cultivation of understanding and support of the PPB project within the value chain and society at large.

Cultivating understanding of PPB depends on marketing and communication. This differs from market development in that it develops concrete steps and strategy for addressing the lack of public awareness of PPB and making PPB an attractive option to value chain partners and consumers. Some farmers noted the need for an overall communication strategy to move PPB into popular understanding, and almost all farmers identified marketable features of PPB from which marketing can be approached. Most approaches will engage with identity preservation, and farmers could use assistance in developing these resources.

The report ends by discussing the barriers for PPB commercialization, some of which were specifically identified by farmers and others which are derived from general observations and trends. Barriers are categorized as risk, hurdles and gaps. Risk is an overarching concern for participants and possible value

chain partners that encompasses all other barriers. The presence of risk in PPB commercialization makes farmers and value chain partners less likely to take meaningful commercialization steps, and so it must be mitigated.

Addressing risk and confidently preparing PPB populations for commercialization requires crossing several hurdles related mainly to scaling up volume and developing markets. Gaps in knowledge also emerged from this study; key points at which information can be gathered and at which communication is needed to make sure farmers and program administrators are on the same page. Addressing these barriers will be an important next step in PPB commercialization.

Clearly there are markets to be developed, and most farmers acknowledge this. But expectations must be managed about exactly which markets are developed. Farmers and administrators can identify the 'soft spots' in the market, or the low-hanging fruit - seeing where, if pushed, the market will budge. That depends on farmers' initial forays and communications with value chain partners. Clearly the grain elevator is not the entry point for piercing the market with PPB, but there are opportunities in small-scale markets and organic wholesale, for example, which could provide space for PPB to gain traction and become commercially viable.

Contents

1. Introduction.....	59
Context.....	59
Approach and Methods	59
2. Participant Value Chains: Structure and Characteristics.....	60
Features Influencing PPB Value Chain Structure	60
2.1 Scale and Market Orientation	61
Large Systems	61
Small systems.....	64
3. Case Study Summaries	67
Farmer 4 - Oxbow, SK.....	67
Farmer 2 - Les Cèdres, QC.....	69
Farmer 7 - Squatec, QC and region	71
Farmer 6 - Agassiz, BC.....	73
Farmer 9 - Brandon, MB.....	75
Farmer 8 - Delta, BC.....	77
Farmer 10 - Morinville, AB	79
Farmer 3 - Cowichan Valley, BC	81
Farmer 1 - Swift Current, SK.....	83
Farmer 5 - Athens, ON	86
4. Status, Intentions, and Expectations for PPB commercialization	89
Some notes on this section	89
4.1 Status of PPB Commercialization	90
Examples of PPB Commercialization.....	90
Progress in Large Systems.....	91
Progress in Small Systems.....	92
Case of Note: Midmore Farms and Strathcona Stone Ground Millers	92
4.2 Intentions, Approaches, and Expectations for PPB Commercialization	93
Large Systems	94
Small Systems.....	95
4.3 PPB Potato Commercialization Overview	96
4.4 Registration Overview.....	97

5. Dynamics and Patterns in PPB Commercialization	98
5.1 Interplay Between Quality, Variability, and Testing	99
Quality – Does it meet value chain needs?	99
Variability – Does it consistently meet value chain needs?	100
Testing – Learning about quality and variability	101
5.2 Market Development	102
Value Chain Solidarity: Relationship and Trust Building, Collaboration	103
Cooperation and Collectivity	104
Direct competition in a numbers game	104
On-Farm Transformation and On-Farm Processing	105
5.3 Marketing and Communication	106
Identity Preservation: Leverage PPB or not?	107
Marketable Features of PPB	107
Communication Strategy	109
Assistance in Marketing	111
5.4 Working from Examples: Red Fife and Marquis Wheat	111
6. Barriers: Risk, Hurdles, and Gaps	112
6.1 Risk	112
6.2 Hurdles	113
Scaling Up	113
Market Development Challenges	114
6.3 Gaps	115
6.3.1 Knowledge Gaps and Context dependant variables	115
6.3.2 Divergent Farmer Understandings of Key Factors	115
Conclusion	119

1. Introduction

Context

The participant farmers in this study are part of a Participatory Plant Breeding (PPB) program that has been delivered in a partnership between the University of Manitoba Participatory Plant Breeding Program (UMPPB), Agriculture and Agri-food Canada (AAFC), and the Bauta Family Initiative on Canadian Seed Security (BFICSS) since 2011. Working with breeders of oats, wheat, and potatoes, participants become integral partners in the plant breeding process - pursuing various goals including the production of seed that is well adapted to their conditions, acquisition of plant breeding capability, and the eventual marketing of their plant populations.

The partners in this program carry out different roles. UMPPB and AAFC are responsible for technical breeding operations such as making the initial lab crosses of farmer-selected parent material, scaling up seed production of farmer populations, managing viral load in potato populations, and gathering data on agronomic performance. BFICSS is the outward facing element of the program, responsible for liaising with farmers, public outreach, and advocating for PPB in policy among many other tasks.

For more detailed background information, please refer the background document (deliverable #1 of this project.) The IPP is chapter one of the full practicum document, and the background report can be found as the first item in the deliverables section. You can also find plentiful resources on the program at the BFICSS website: <https://www.seedsecurity.ca/en/programs/create/field-crops>

Approach and Methods

This report is derived from semi-structured interviews with ten farmers. Interviews were recorded on Zoom and then transcribed verbatim using AI transcription software. These transcriptions were then edited manually.

Transcripts were informally coded by colour in Microsoft Word. Broad code categories were developed partially in line with the interview schedule which was in-turn developed from discussions with the project team and the background report. Code categories were also informed iteratively by the broad trends that were emerging in interviews. The categories were:

- Participant background and PPB context
- Current market and value chains + PPB commercialization status and intentions
- Barriers to PPB commercialization
- Suggestions and possible approaches to PPB commercialization

This coding and sorting of farmer quotes and ideas formed the blueprint for individual case studies which reduced and summarized interview content. Coded data and quotes were sorted into related and pertinent sub-categories which were then summarized in paragraphs. These individual case studies are included in the following summary report as 'one-pager' summaries, and they also form the core of deliverable 3 – 'detailed farmer profiles'.

The same broad coding informed the development of this summary report, the results of which are a combination of farmers thoughts and researcher analysis and observations. The document came together through an iterative process – grouping related farmer ideas, contributions, and quotes and then

solidifying them into chapters. Researcher analysis largely arose from observation, trend recognition, and connections made to background knowledge in economics, ecology, and other areas related to natural resources management.

2. Participant Value Chains: Structure and Characteristics

This chapter outlines the common structures and characteristics of PPB participant value chains - primarily delineated by scale but also considering other factors that influence value chain composition. I will first describe some factors which are not related to scale that provide a useful lens through which to understand the chains, and then I will describe scale distinctions in detail.

The first goal of this project was to understand the structure and characteristics of PPB participant value chains, including common market arrangements. A clear picture of the pre-PPB value chains of PPB participants describes the starting point of PPB commercialization. It describes the existing features of value chains that will either support or hinder PPB value chain development.

In this case, 'structure' refers to the material flow of goods, value, and profit as a product moves along the chain. It is best depicted through diagrams, which have been included for large and small chains. 'Characteristics' refers to the qualitative features of the chain – describing participant's, thoughts, interactions, and social considerations.

Features Influencing PPB Value Chain Structure

Though farm and market scale are major determinants of value chain characteristics, other features of farms and markets should be included in the consideration of why and how value chains work the way that they do. These features are largely related to location and the distinct physical and social characteristics of a region, as well as decisions to process on-farm - including the use of self-produced items within the farm system.

Location and regionality influence value chain structure in several ways. Especially for producers interested in short food chains and regional food systems, the features of their region will influence how they produce and the markets they seek. Firstly, regional differences in food culture and variability of value placed on terroir, local resilience, and support of local business will have an impact on value chains. Artisanal bread makers are abundant in Quebec for example (#2, #7), where local production can find a multiplicity of outlets. This contrasts with a major crop exporting areas like the prairies, which may have a less robust local food culture – especially compared to its overall agricultural output.

Regional differences in population density, urban proximity, and availability of agricultural land will also affect value chain composition and market options available to producers. One example would be the difference between producers in Southern Ontario and the prairies. Ontario producers are closer to large urban centers with numerous artisanal markets due to population density, and they operate smaller farms due to limited land availability. In contrast, prairie farms are on average much larger than those in S.O. but lack the population density and proximity to urban centers to support the same number of artisanal markets.

On-farm activities such as processing and value-adding, as well as on-farm consumption will also affect value chain structure. Large or small, farmers can opt to process their agricultural products – altering the markets available to them and often adding value to an otherwise raw commodity.

One example is the difference between a grain producer and a grain producer with an on-farm mill or other machinery for cleaning, crimping, and rolling grain. The grain producer is limited to grain markets, whereas the on-farm processor can sell grain, processed grains, and flour. This can shorten the chain by cutting out processors, but it also necessitates the discovery and management of new markets for value added products. Farmers like #7 who feeds her oats to her calves or Farmer 9 who feeds his livestock from his own farm also cut out chain actors and internalize parts of their value chains – retaining an element of self-sufficiency that can be desirable to them and to consumers.

2.1 Scale and Market Orientation

Beyond location and on-farm processing, the most general value chain distinctions relate to scale and the market orientations that are common to certain scales. Scale has implications for the opportunities and challenges farmers will be presented with in marketing their products and eventually commercializing PPB if they choose to do so. This section unpacks the multiple implications scale has for the development and resulting characteristics of value chains.

“The smaller you go and the smaller the package, the higher the value.”

– Farmer 5

‘Small’ and ‘large’ systems carry with them distinct value chain interactions that can be helpful for considering modes of PPB commercialization. This allows for some broad categorization and a way to frame discussions of value chain structure and composition. Naturally, each participant occupies different permutations or combinations of these shapes – some of them occupying something of a mixed or middle ground – but this discussion is intended simply to illustrate the scale spectrum, starting with larger and then moving to smaller systems.

Large Systems

Common to large producers is the use of brokers as the first step in the value chain, with implications for the path of the product and the involvement of the farmer in further value chain steps. It is at this stage that farmers may encounter brokers who will only purchase registered variety names. This creates a barrier for those who wish to produce unregistered crops, and the same barrier will apply to PPB populations. Crops also enter fungible¹²³ organic grain markets (further discussion on fungibility can be found on page 107) upon transfer to brokers – that is, markets in which the identity of the original producer becomes obscured and the crop is mixed with those of other producers to become a generalized organic commodity. ‘Organic’ becomes the only traceable element. This feature, along with the following commonalities of large systems are depicted next in the ‘large systems’ diagram.

¹ Giroux, Randal. "Enabling coexistence: Balancing innovation and market access." North American Agricultural Biotechnology Council, 2015.

² Trauger, Amy, and Murphy, Andrew. "On the moral equivalence of global commodities: Placing the production and consumption of organic bananas." The International Journal of Sociology of Agriculture and Food 20, no. 2 (2013): 197-217.

³ Clapp, Jennifer, and Sarah J. Martin. "Agriculture and finance." Encyclopedia of food and agricultural ethics (2018): 1-10.

“Most mills mill everything that meets in the hard red spring class, they'll mill it. And they're big. Like these are big facilities and they do a lot of different products. So it's not that important that they have one particular variety that they can brand and sell as a special brand.”

– Farmer 4

The role of the producer in these large value chains effectively ends when they sell their product to brokers. This study did not follow the value chain beyond brokers, but the farmers have indicated that the crop, at this point, is milled into organic flour or used as an ingredient in distilling, baking, or any of the other uses of grain in organic products. The end-point consumer knows they are consuming an organic product, but typically is not connected to the source of their grain.

As the chain progresses to the processors and retailers who purchase from brokers, a product is deemed desirable (and value is derived) mainly through quality and cost. Product fungibility makes it difficult to value crops beyond price and basic quality standards for different crop classes, and this valuing is maintained down the line to farmers. Elaborating, in a market of fungible organic grains, the only distinction a distiller/processor can make beyond the basic achievement of quality standards is price. The processor will choose the cheapest product if it meets their processing requirements. The broker must therefore offer a cheap product to the processor, necessitating the purchase of grain at the lowest possible price.

This downward pressure forces farmers to either accept or reject the prices offered by the market – often prices that decrease their already thin profit margins. Though PPB participants typically value soil and environmental health - and some participate in PPB for this reason - the ability to produce low-cost crops with good agronomic performance and high yield remains a priority.

After purchase and processing, processors and retailers have an expanded range of value-adding options in their marketing and will make pricing decisions based on cost of production, brand strength, and their ability to sell at premium. They can create value through unique production methods, product distinctiveness, product quality, health and environmental claims, and branding. This value is detached from the value of the raw grain or potato, and none of it is returned to the farmer beyond the initial organic premium.

Bulk purchasers and brokers face challenges in preserving identity, but Fraserland Farms has managed to have its identity preserved in larger and primarily BC based retailers. Some larger farmers have also described opportunities to sell directly to mills and this could be a first step towards preserving identity in larger systems.

“This last couple of years now when we've gone to sell our grain - and it's actually the same company in the last three or four years - they are now asking us what variety it is. And I think what they're trying to do is really just head off problems.... If they're dealing with much volume, you can't afford to take on much risk”

– Farmer 1

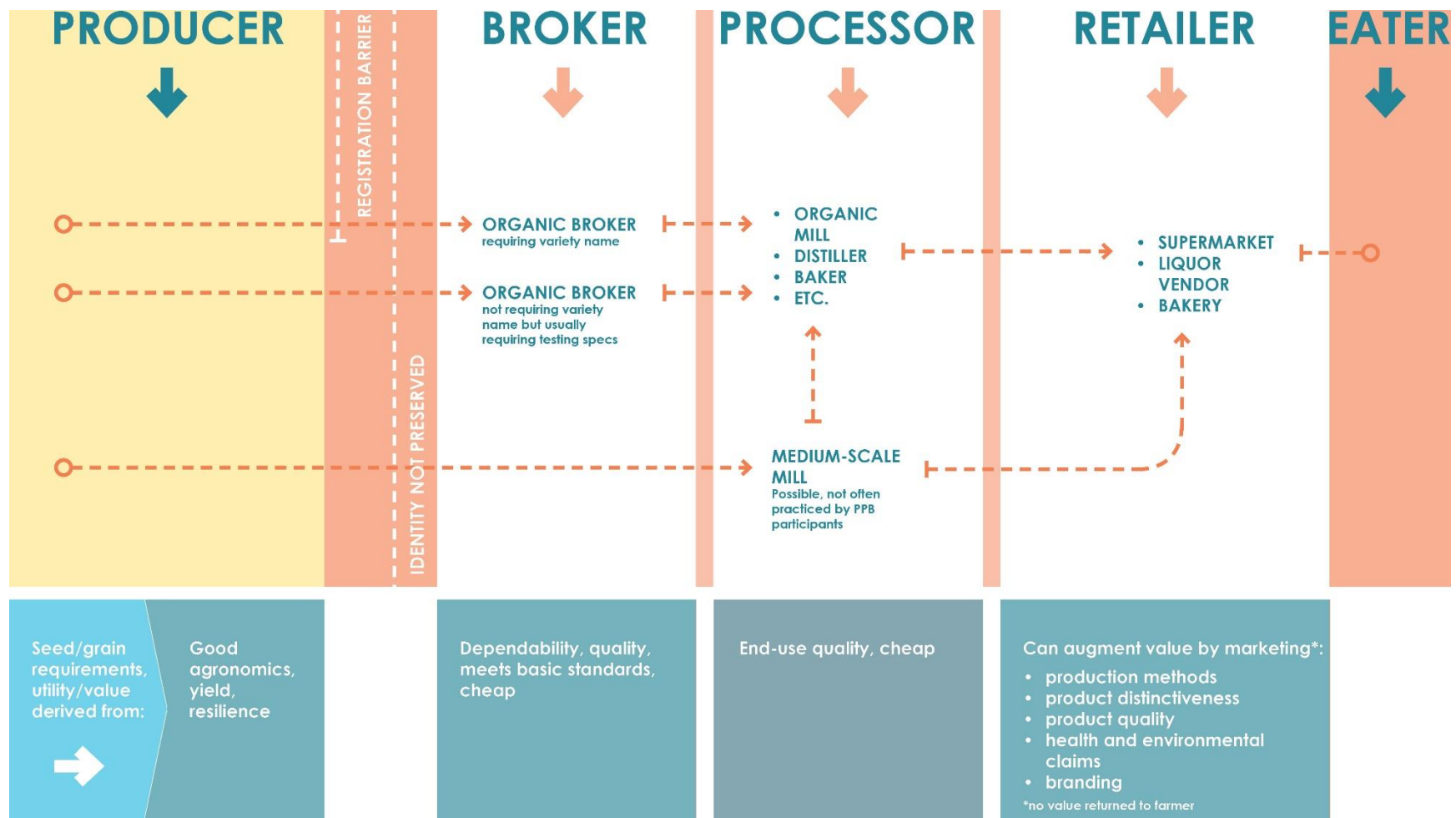


Figure 5. Large Systems Diagram

Lines depict standard path for crops from producer to eater and the value chain partners in-between. Path is unidirectional and roles are well-defined and separated. In transition from producer to broker, identity is lost and registration requirements sometimes pose a barrier to sale.

Bottom row indicates the requirements of - and the utility/value derived from – the population/crop for each actor in the chain (producer, broker, processor, retailer).

Small systems

Small producers participate in a constellation or ecosystem of products, services, and value chain actors - many working together or in tandem to meet their collective needs based on their unique capacities. These chains are comprised of tight, relationship-based forward and backward linkages, with shifting value chain roles and diverse markets. Identity is almost always preserved in these chains, and producers, retailers, and customers openly import social and political values into their choices.

If the large system can be described as linear, this would be non-linear in that it does not follow a standard path with clearly defined roles, but features farmers and processors with numerous crops and markets. These markets can range from farmers markets to Community Shared Agriculture, to off-farm sales, to processors like bakers and millers and more. Product delivery is often more frequent due to the low storage capacity of processors and retailers and their desire for freshness. This increases the frequency of communication and tightness of connection.

"It's just [that] it's literally 700 times more expensive and nobody will buy it unless they're pre-existing customers - but all you need to do is feed them a freshly homegrown organic potato with a beautiful radial array inside of it, and their mind will be blown."

– Farmer 5

Importantly, all of these producers exist at a scale and are oriented so that identity preservation is both possible and encouraged. Farmers are either interacting directly with end-point consumers or having their story shared with end-point consumers through the value chain. Most small producers in this study have also created an internet presence that leverages their personality, humanity, commitment to environmental sustainability, and the uniqueness of their products.

Another way to consider identity preservation is as 'non-fungibility' of products, and this is in many ways the origin of the value derived in these systems. Consumers in this chain desire ethically sound food and are often politicized towards food system reform. They value short food chains and connection to their sources of food and are willing to pay a premium for these values, absorbing the higher production costs of local-organic-regenerative food.

Variety heritage is one important avenue for identity preserved value in small systems, and this should be of specific interest to PPB producers. Cultivar-specific flavour profiles and histories are increasingly attractive to consumers and can therefore add value. Eaters in small systems are more likely to seek unique stories, flavours, quality characteristics, and they are more likely to take an interest in these subtleties. These eaters also have the capacity/interest to deal with the irregularities that come from unique products. (i.e.: changes in baking quality with heritage grains, which require recipe tweaks.)

Processors also benefit from the market desire for local, organic, 'connected' food and the close connection between processor and farmer allows value to be passed back to the farmer. This is because the close relationship between value chain actors often results in collaboration and the ability for actors

"[We have a] clientele that also wants to support with their dollars a system that is outside of the traditional or the current food system. I think that it's something that very easily ignites a lot of passion in the customers that are coming to our door - these kinds of stories."

– Farmer 10

to communicate their needs and interests to partners who can seek to meet those needs. As an example, multiple PPB farmers have developed markets based on bakery requests to grow specific grain varieties. Features like this are what make PPB appealing in small systems.

Small Systems Diagram

The following small systems diagram represents hypothetical material and value flows based on common value chain patterns for the farmers in this study. Information and feedback between value chain partners also flow along these lines due to spatial proximity, shortness of chain, and the more personable and frequent scale of transactions. These features are also evident in the presence of direct connections to the eater from almost every value chain actor node. Each line, tracing a path from producer to eater (left to right), represents a unique path for a crop - not a specific farmer. Participant farmers can, and often do, occupy multiple paths in this diagram.

Processors and retailers are depicted on a continuum because many occupy roles that share features of processing and retailing - as in the case of restaurants with in-house bakeries. They are located on the continuum in a manner that depicts their balance of activities towards either end of the spectrum. Some of the noted processors and retailers (which are also taken from this study) represent specific roles and some are general, listing examples underneath. Many of the processors and retailers noted in this diagram apply mostly to wheat, but the general paths are still similar for oats and potatoes.

Pathways in orange, near the top of the document, represent the most direct paths for crops. These include direct marketing and chains with only one value chain partner between producer and eater. These pathways depict the prevalence of simple and short value chains in small systems - a feature that retains value for the producer and connection to the eater. Note that the top pathway, which transects the other pathways and ends on the bottom, takes this path so that "Direct Marketing" does not have to be repeated.

The multi-coloured pathways depict another common feature of small systems - tight integration, non-linear material flows, and the occupation of diverse roles by individual actors. Custom and on-farm processing are good examples of these features, as you would seldom see a processed product returning to the hands of the farmer after a custom job in larger systems. Farmers also blur lines by processing on-farm in varying degrees - from light rolling, to grain cracking and crimping, or a more significant transformation like making wheat or beer.

In contrast to the large systems presented earlier, note that there is no point at which identity is incidentally or by necessity severed in these small system pathways. The story and identity of the farmer, and often the story of the cultivar itself, is preserved. In this way, the value and utility derived from the cultivar is similar to that in large systems with the addition of the value derived from collaboration between value chain actors. Note as well that distributors and local food amalgamators do appear in some small system chains, but they are infrequent and would have complicated the depiction of the processor-retailer continuum.

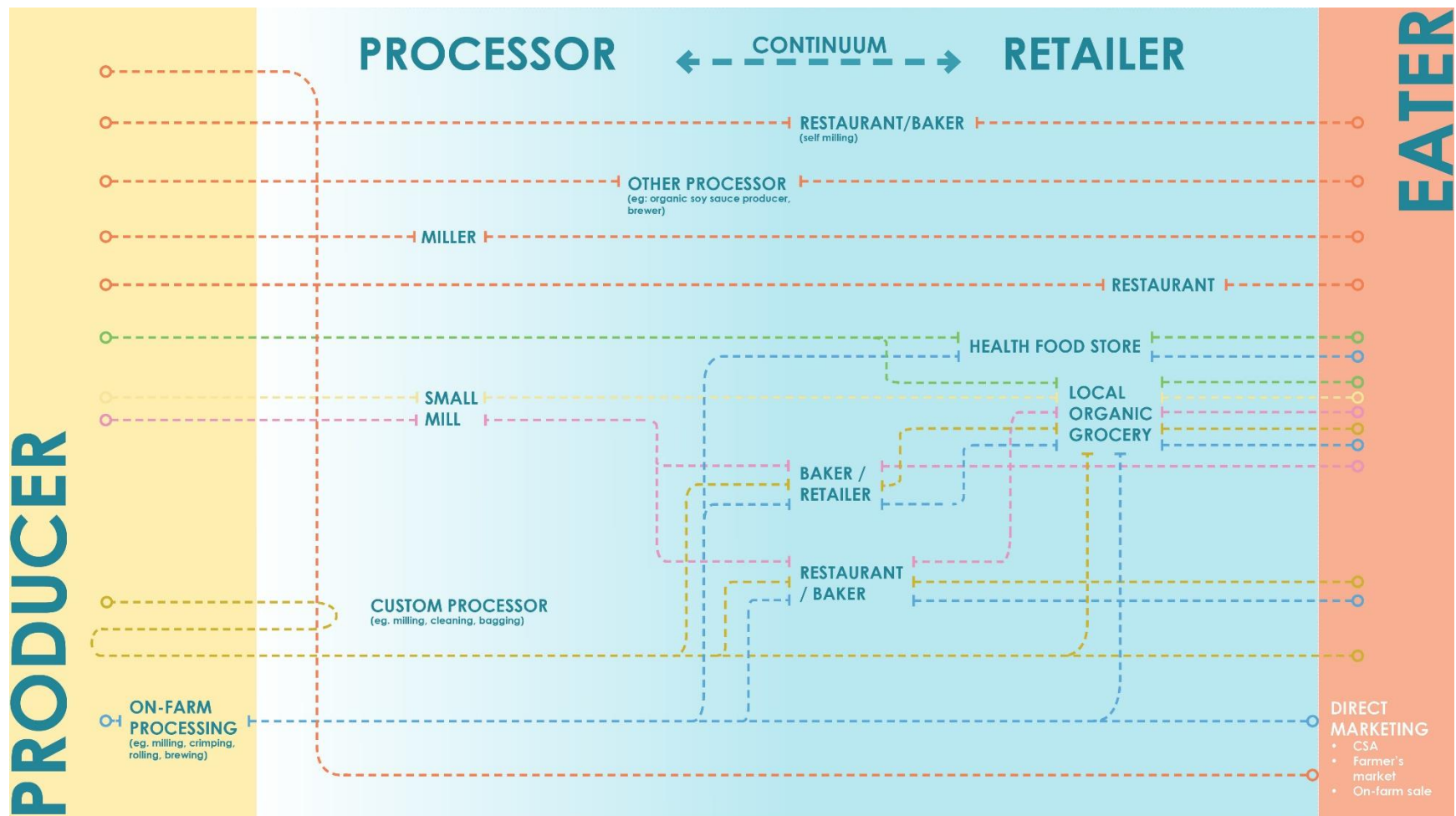


Figure 6. Small Systems Diagram

Lines depict hypothetical paths for crops from producer to eater and the value chain partners in-between. Study participants' value chains often incorporate several of these paths. Processors and retailers are placed on a continuum as they often participate in both roles, blurring the boundary between the two.

3. Case Study Summaries

The following case study summaries for individual farmers feature interview content that is relevant to PPB commercialization specifically. Each case starts with a summary of the participant's experiences with, and expectations of PPB commercialization. The summaries then distill barriers to commercialization, and finally they describe participants' suggestions and possible approaches. For some cases, researcher comments were included when the interview yielded novel information/ideas, or if researcher interpretation was relevant.

Farmer 4 - SK

Farm: 4400 organic acres

PPB Crop: Wheat

PPB Overview: Continues work on wheat crosses. Testing PPB populations as part of Michelle Carkner's doctoral project and will multiply volume significantly once he finds the most suitable population.

Case Summary:

General commercial goal: Produce an agronomically superior wheat that meets quality requirements and yields enough to justify seed saving. Registration is a possibility if it consistently performs very well. Not considering branding.

Thoughts on commercialization are speculative until testing concludes and he decides on a population.

Four populations in PPB comparative trials

- 4000 lbs. of one population, could plant 30 acres but waiting on trials before scaling up
- Will still need more product for dependable quality testing

Status/Intentions:

- At a large/medium scale there is more pressure from the value chain for cultivars to be registered
- Options for unregistered
 - Anticipates a range of interest from purchasers and millers in unregistered variety
 - Most mills mill everything that qualifies as Hard Red Spring Wheat
 - Believes discussing PPB with buyers would be a fairly easy conversation to have
 - Closed loop system
 - Would give more flexibility of options/outlets
 - Branding is possible
 - Identifies an expanding market for branded wheat, but this market is still quite small
 - Would involve a shift for Iain, requiring time and effort - so not very appealing.
- Seed saving
 - 10% yield increase from PPB would make saving seed more attractive/viable
- Many value chain partners are open to new and interesting opportunities
 - Must make financial sense
 - Not likely to gamble on un-proven, untested ideas

Barriers:

- Capacity of UMPPB to arrive at useable/testable populations
 - This is not a criticism – he simply identifies that he cannot assess markets until he has something to offer
 - This takes time, and he will not proceed with an inadequate population just because he worked on it.
- Productive and easily accessible non-organic pedigreed seed (through derogations) is an attractive choice. Organic and PPB varieties will have to perform very well to compete in this market.
- Unsure which opportunities exist for other farmers to access his material and vice-versa

Suggestions and possible approaches:

- UMPPB and PPB farmers should be clear on the function and goals of the program
 - Likely it will be an “ongoing process of breeding, selection, evaluation and adaptation”
 - Likely not aiming to produce static varieties that can be used in perpetuity
 - Hard to do because of waning efficacy of varieties over time and continuous search for superior germplasm
 - Static vs ongoing nature of PPB selection will change commercialization intentions
 - Long term branding value vs immediate agronomic superiority
- PPB group/collaborative component strengthens program
 - More farmers would strengthen the program
 - Sharing/comparing experiences and approaches
 - Expanding total amount of genetic material moving through program increases probability of arriving at commercially viable populations and registration candidates

Farmer 2 - QC

Farm: 1600 acres. Includes on-farm mill.

PPB Crop: Wheat

PPB Overview: On pause after #2's retirement. Produced and began scaling up one line which was well-received in baker focus groups.

Case Summary:

#2's PPB participation is on permanent hiatus, as he has retired and his kids who took over the farm have not yet continued his PPB work due to the demands of the transition. Nonetheless, #2 has useful insights on the commercialization process. The following notes refer to #2's goals at the time of participation.

General commercial goal: Feed on-farm mill with PPB population, substituting his current variety. No intention to profit from variety development.

Was in the process of scaling up one line, but it should be noted that his non-PPB variety at the time was out-yielding his PPB line by 15-20% which would have had great impact on mill profitability.

#2 maintained a close relationship with the bakers and chefs in his value chains and relied on these connections for market development. They were aligned in mission and values for self-sufficient, regenerative, local provisioning, and he anticipated them being supportive and interested in the PPB project - PPB being a value-added feature for them.

Barriers:

- Risk of investing time and resources into a population that ends up not having adequate end-use quality
 - Testing beyond stone mill requires larger quantities and therefore scaling up a population of unknown end-use quality
- Bottleneck: Wants the benefit of agronomic resilience through genetic heterogeneity, but value chains require product quality stability
- Inability to access crop insurance in Quebec unless using varieties from a narrow list

Suggestions and possible approaches:

- Exclusion from crop insurance can be addressed by using exemptions available to producers who's seed heritage is central to their project and cannot access that seed any other way
- Responding to product stability:
 - Reserves half of each crop to be mixed with the next year's crop, creating continuity between seasons
 - Many smaller bakers can manage varying flour quality characteristics by tweaking recipes, and mixing and manipulating grain constituent components
- Should be developing quality testing procedures for smaller quantities

- Iterative assessment process starting with small groups of value chain partners
 - What can be done with the flour as it is?
 - What can be changed?
- Capitalize on concepts of food sovereignty and self-sufficiency in PPB marketing
 - Especially pertaining to supply chain vulnerability and climate change

Farmer 7 - QC and region

PPB Crop: Oats, some wheat

PPB Overview: Has gone through three generations of selection of three seasons each. Selects on a client's land with the intention of developing populations that suit the needs of her clients.

Case Summary:

#7 is a consultant to farmers in her area and participates in PPB partially on their behalf.

General commercial goals: Uncertain. Possibly to produce oats for her cow-calf operation. Produce appropriate varieties for local organic systems and her client farmers.

Working on numerous oat crosses - currently in third year of third cycle. Partially doing this work on behalf of her clients.

Sees a desire among consumers for local, resilient, regenerative food, which would include PPB.

Barriers:

- Main barrier to PPB commercialization is on the production side
 - Production is not meeting demand for locally resilient, innovative, regenerative food
 - "If the production isn't there, we can't offer the product to the consumer even if he asks for it."
 - Having difficulty scaling up due to lack of specialized, scale-appropriate machinery for seeding, harvesting, processing
 - Often this equipment is older and hard to maintain
 - Especially challenging is the scale in between hand-work and work for a large machine.
 - Lacking collective social/commercial infrastructure (collaboration) that could popularize and facilitate production
- Lack of producer awareness and participation in PPB in Quebec
 - Many hesitant to advertise/display participation in alternative approaches
 - Influenced/impeded by opinions of neighbours
- Lack of awareness of the program among general public
- Lacking broader public explanations of the reasons for participating and education about the needs met by PPB
- Registered varieties are required for federal and provincial funding programs
 - PPB does not yet meet this requirement

Suggestions and possible approaches:

- Must normalize and popularize PPB, make it accessible to producers, and increase participation
 - If producers knew about and understood the program they would participate
 - Producers have an interest in alternatives
 - PPB meets alternative aspirations of young people

- Increased farmer participation creates momentum for other farmers to participate because they influence each other
- More farmers strengthen the substantive work of the program
 - "Producers, at some point, find solutions when they talk to each other."
- Normalizing and popularizing requires marketing and communications
 - Communications strategy focusing on social media
 - Build familiarity, stimulate questions and interest
 - Social media is a popular tool for Quebecois farmers and young people
 - Marketing support for PPB producers
 - Many farmers (including #7) lack confidence and knowledge in marketing
 - Especially in niche products
 - Could engage marketing specialists/consultants
 - Helpful for farmer adoption of PPB
 - Helpful to get consumers to see value in PPB
 - Some kind of smaller PPB marketing coop could appeal to organic producers
- PPB field-day to stimulate interest
 - She could set it up and plant PPB selections from Bauta
 - Bauta staff can visit and present
 - Demonstrates efficacy of PPB
 - Facilitates farmer exchanges and questions
 - Farmers may encourage each other and continue to consider it
- Solution to machinery scale issue: Organize amongst producers to share equipment and work in farming and processing (possibly share rental equipment).
 - Gives the value chain the "means to organize itself"
 - Diversifies income without having to take on full risk and investment in scale transition
 - Could popularize PPB and make it more appealing for farmers
 - Collaborative activities could be farm-tourism opportunity
 - Showcase PPB for prospective farmers, demonstrate viability
 - Showcase PPB for consumers
 - Sell value-added products to consumers

Researcher comments:

#7 is a unique case if she intends to use her PPB oats solely on her farm as feed only. She can pursue the agronomic and quality traits she needs to improve oat growing on her farm and there are no barriers to this.

The seed sharing/selling networks that #7's clients currently participate in could serve as an example of the avenues for PPB distribution.

Farmer 6 - BC

Farm: 94 acres

PPB Crop: Wheat

PPB Overview: Continues to scale-up and test wheat cross which entered his CSA for the first time in 2021 season and was well-received. Bulk seed in 2022 and ready to market to CSA in 2023.

Case Summary:

General commercial goals: Supplant current HRSW variety, possibly share with other producers if population performs well. No intention to register.

#6 is bulking up one PPB line, and had enough in the fall of 2021 to supply his CSA. Further quality testing is required, as well as demonstrating longer term agronomic performance. Early testing by CSA members suggests #6's PPB line is desirable for bread making. In 2022 he opted to bulk up his PPB seed supply instead of selling into the CSA, and now has ample seed for the 2023 season.

Interested in the story of genetic heritage and variety development as a hook for the purposes of education and marketing. Believes CSA members will be interested in the story behind PPB. Currently working with and benefitting from the branding of the heritage grain 'Marquis'.

#6's value chain partners are mostly at a scale at which they can benefit from wheat identity preservation and leverage the story and branding potential of PPB. Some already employ wheat branding in their operation.

Notes better premium selling through bakeries than CSA, but this does not dissuade him from pursuing CSA.

Barriers:

- Uncertainty about options and procedures for quality testing
- Lack of clear story and description of the project and product for marketing
 - No concise source of information for customers
 - Time is required to develop these resources and educate customers

Suggestions and possible approaches:

Mostly related to branding and marketing

- Consumer interest is essential to commercialization, especially for more expensive products
 - Interest/awareness must be built
- Possible first step: An engaging and simple page on the Bauta website describing and marketing PPB for public and prospective purchasers. (See 'Salmon Safe BC' website as an example)
- Create marketing materials and information:
 - Could use name, logo, catchy phrase beyond "Participatory Plant Breeding"
 - Produce stickers, banner to use at markets

- Produce a brochure to summarize PPB story
 - What is it, why is it different?
- Marquis wheat is a useful example of branding/popularizing wheat
- Should communicate the cooperative nature of the PPB program
 - Individual farmer participation is part of “something bigger”, part of a collective and a movement
 - Online interactive map could be useful for this
 - Would add value for consumers
- The aforementioned marketing/branding takes time and expertise to develop
 - Could benefit from professional support
 - There may be people willing to help with this for free or reduced rate

Researcher comments:

#6's experience with small bakeries and Millers suggests that bakers and Millers who are already buying local grains and specialty grains are already inclined to some degree to pursue novel grains and are likely to relate the story of their grains to their customers - adding value in doing so. They are more likely to preserve identity.

A novel retail actor from #6's case is a bulk 'bring your own container' store in Vancouver. They were able to sell #6's grain and also requested information about his grain that could be transferred to the customer. This could be an interesting value-added stream for unregistered PPB varieties.

#6 sees utility in communicating the collective/cooperative aspect of the PPB program to consumers and the broader public. Other PPB participants see value in the collective, but #6 sees this as an important part of the story, the branding.

Farmer 9 - MB

Farm: 900 cultivated acres, 1100 in native pasture

PPB Crop: Wheat

PPB Overview: Completed wheat selections, now bulking up (apprx 2 bushels). Two years away from adequate quantities for testing and sale.

Case Summary:

General commercial goal: Pending development of a promising wheat population, #9 would look to market it as grain, possibly unregistered. Registration would facilitate variety marketing and dispersal to other producers, organic and not.

Hesitant to speculate on commercialization and will assess his options when the opportunity arrives.

Currently bulking one of four crosses, likely to plant one acre in 2021. Performs well agronomically - not yet tested thoroughly for quality. Requires more volume for testing.

Most of his customers will require competitive price-point. Will not benefit from identity preservation.

Custom milling is another possibility, but not a priority for Ian.

Barriers:

- PPB unlikely to add value for larger purchasers
 - No interest in identity preservation
 - PPB lines derived from heritage varieties may deter customers based on quality concerns
- Complexities of registration
 - Difficult process, especially if the farmer pursues this independently
 - Requires more time and money
 - Uncertain about supports available to farmers for registration
 - Notes changes in staff, professional partners, industry advocates (ex: at AAFC) shifting institutional memory and capability.
- UMPPB process barriers
 - Long process
 - Uncertain end-use quality outcomes

Suggestions and possible approaches:

- Smaller mills will be the most likely to be interested in purchasing PPB
 - Interested in story
 - Capable of identity preservation

- Identity preservation is main value-added component or selling point for PPB aside from quality and price - especially for unregistered
 - Capacity/interest in identity preservation is inversely related to processor/purchaser size.

Researcher Comments:

#9 is one of the few producers who discussed custom milling. Though low in his priorities and interests, it is a novel approach to PPB commercialization, and one that could bypass registration requirements. It would however require a flour market in addition to a grain market, which is not necessarily available or appealing.

Farmer 8 - BC

Farm: 600 acres (of potatoes)

PPB Crop: Potato

PPB Overview: On hold in bulking process after two selection cycles and entry of one cross into variety trials.

Case Summary:

General commercial goals:

- Registration of agronomically superior potato to grow on farm and sell as late generation certified seed and commodity.
- Does not consider propagating and selling a population outside of registration.

Unable to speculate on PPB commercialization plans before a superior potato is achieved.

Produced two promising lines. The one that #8 was most interested in was not trialed, but the other was entered in trials and performed well. Paused in bulking process as of 2020.

Believes PPB could possibly benefit in the consumer market by leveraging the story and concept of PPB as well as producing a unique/quality potato.

Barriers:

- Mostly related to registration and market development process (complicated, costly, time consuming, long process, risky, uncertain, could prove fruitless)
 - Current line is best of PPB selections, but no indication it is competitive/superior or the best for #8's program
 - Gamble moving a single population through the process while competing with other orgs working with 1000s of lines, more resources, and specialization
 - Market work of attracting initial buyers of seed to create traction is tenuous and speculative with fluctuating market tastes, and significant time lags for producing adequate quantity
- Tiny organic potato and potato seed market, complicated by ease and ubiquity of organic derogations.
- Finding early generation cloning lab and seed producers willing to take on PPB

Suggestions and possible approaches:

- A "more laid out path" from selection to commercialization
- Post-selection handoff from farmer to Bauta or another organization for registration and market development

- collectivizes strain and responsibility on the individual
- engages expertise of professionals in the field
- Farmer could access later or be recognized by some means
- Develop/support a system geared towards smaller production
 - Alternative channel of registration (alternative category)
 - Temporary crossover into conventional market to develop traction/buy-in
- Learn from others in the field with expertise and success in small scale breeding and market development
 - Ex: International organic breeding programmes.

Researcher comments:

#8 already has some markets that focus on the #8 identity and build their programme around the farm. This is an example of a market orientation conducive to preserving and leveraging the PPB identity - if not adding value, then simply making it a more attractive option. His experience branding "Pugly Potatoes" could also serve as a blueprint for marketing PPB.

Demonstrates effective engagement with an online audience.

Farmer 10 - AB

Farm: 850 acres

PPB Crop: Wheat

PPB Overview: Satisfied agronomically with one population. Currently multiplying and preparing for quality testing.

Case Summary:

General commercial goals:

- PPB population to supplant current direct marketed Hard Red Spring Wheat.
 - No intention to begin milling or processing.
 - No intention to register or capitalize on ownership and would likely share seed willingly.
- End-use quality so-far unknown
- Commercialization will be dependant on satisfactory end-use quality - will require end-use quality testing, baking trials, long term testing

Midmore moving increasingly to direct market.

- This is the crucial factor facilitating #10's PPB commercialization. His ability to develop this market is directly related to his ability to develop PPB.
- PPB has been communicated to some clients/customers who are willing to trial it
- Bonjour Bakery as well will participate in testing

Markets:

- Direct connection to consumers through on-farm sales
- A number of small/medium-scale/craft processors, some organic
- "Monitoring"/'keeping an eye out' for larger chains expanding into 'local' sourcing.
- Leveraging local food and the benefits of older wheat varieties inc. health.
- Customers are passionate about alternative agriculture

PPB Marketing:

- #10 is confident in consumer enthusiasm for PPB, optimistic PPB story/brand will add value in market
- Will leverage notions of climate adaptation, genetic variability, local and short value chains

Barriers:

- Gamble on end-use quality being adequate
 - Inability/uncertainty re: selecting for quality and testing earlier in selection
- Gap in seed multiplication presented by lack of mid-sized or plot sized equipment
 - "Too big for the garden, too small for the field harvester"
- Burden of population maintenance, and storage
- Value chains and end-use markets limited to processor production capacity

Suggestions and possible approaches:

- Employ private research organizations (possibly farmer-run) to help bridge the middle stages of multiplication. (Ex: Gateway Research Organization, others across the prairies.)
- Appeal to provincial organic organizations (ex: Organic Alberta) or other aligned organizations to carry "after-selection" development and registration.
 - Possible revenue stream for them?
- Likes the idea of interactive map as a deliverable and sees marketing applications
 - To consumers
 - Among farmers

Researcher comments:

#10 has presented some interesting avenues for the operationalization/commercialization of PPB, including the possibility of new value chain partners. His most unique opportunity for PPB commercialization is through his relationship with Strathcona Stone Ground - millers on the small end of medium scale who sell to Friesen Brothers grocery stores. Friesen Brothers are regionally owned and operated retail grocers at the scale of Sobeys or IGA who agreed to take Strathcona wheat despite their limited production capacity. If #10 supplants his current wheat variety with his PPB line, Strathcona has already agreed to try it. As long as it meets quality specs, this means that an unregistered PPB population could enter a 'conventional' consumer market with no questions asked. This would be a novel pathway for a PPB product.

Two hypothetical opportunities proposed by #10 would engage farming organizations and possibly offer pathways to new value chains. Firstly, he may engage Gateway Research Organization - a private group fulfilling custom agricultural research/work requests - to scale up his population past the plot size. #10 notes the existence of groups like this across the prairies, and if PPB farmers were to contract this stage of the breeding process, these organizations would represent a novel 'upstream' value chain actor. Another hypothetical value chain actor could be created if provincial organic organizations (or other farmer-run organizations, for example) were to take on custodianship of a PPB line after selection. These organizations may have more capacity than an individual farmer to carry a population through registration and market development. They could maintain the plant breeders rights and profit from this ownership as a revenue stream, almost as a social enterprise, returning royalties/recognition/access to the farmer while still aligning with the democratizing impetus of PPB.

Farmer 3 - BC

Farm: BC (Farm is closed and #3 is no longer farming commercially.)

PPB Crop: Potato, some wheat

PPB Overview: While farming actively, managed to sell PPB potatoes into farmers market. Maintains one PPB potato variety in personal garden. Did some PPB wheat selection and still has a few bags of seed.

Case Summary:

#3 is no longer farming but is the only UMPPB participant to have successfully sold PPB potatoes. He maintains some production for interest, research, seed, and breeding purposes. His case is still interesting from a commercialization perspective.

General commercial goals: While still farming, #3 had intended to continue producing and stabilising his most promising three or four PPB lines. He would have continued to sell them at farmers markets, possibly move them into his CSA, and potentially share seed with other farmers in the area for their own production. He did not intend to register his populations.

Maintains his PPB potato populations in his personal garden.

Projected good market potential based on visual appeal and interesting story of potato.

- Population would have benefitted from having a name/title.

Barriers:

- Marketing
 - #3 found it difficult to know what to say to customers about his population
 - Low baseline of public understanding of plant breeding
 - PPB story was interesting to some but also was confused with GMO by many customers
- Registration
 - Daunting, labour-intensive task
 - Would not want to be main applicant
 - Can sell without registration, so not of interest
- Population maintenance
 - Pressure to buy new clean seed every year
 - Difficulty saving own seed
 - Limited information on how to do this
 - Difficulty managing viral load in propagation, especially as small producer (has not yet encountered viral load suppression in his PPB potato line)
- Lack of quantity and quality consistency due to genetic variability
 - Difficulty repeating a product and offering it consistently
 - Lack of ability to assess/test for baseline quality indicators and describing characteristics

- How can you assure a customer what they will be getting, describe it, and describe the uses for it?
 - This might improve automatically in later generation germplasm
- Wheat
 - More difficult to commercialize than potato because of uncertain selection process (quality characteristics are not immediately apparent) and time it takes to produce a consumable volume
 - Potato you can judge immediately by taste and sight.
 - Less interest and knowledge about wheat varieties in the market
 - Seen as homogenous and fungible

Suggestions and possible approaches:

- Need a process for assessing, classifying, and describing potato end-use qualities objectively
 - How to compare with existing options?
 - Develop language around quality characteristics
 - Does not need to be overly complicated
- Thoughts on utility of a commercialization/branding assistance 'package':
 - No:
 - Commercialization is context dependent.
 - Each farmer will know their own market better than anyone else.
 - Would gain more from conversation/sharing with other farmers re: commercialization approach
 - Yes:
 - Might be more useful for a larger producer
 - Standard potato varieties are well entrenched in the market and will require a good potato, a good explanation, and a good story to overcome this
 - Ambivalent about ability of PPB story or unique potato to increase sales
 - Cites Red Fife and Yukon Gold as examples of effective branding.

Researcher Comments

#3 touched on small-scale potato propagation several times - a bottleneck that is unique to potato. He was uncertain about the options for addressing generational viral load accumulation and was curious about on-farm methods of seed propagation. This feature of potato production increases dependency on outside assistance and is ostensibly more available to larger producers. Options to overcome this and propagate safely are not clear in the PPB process, but it is a crucial step to scaling up production and commercializing.

Farmer 1 - SK

Farm: 3500 organic acres

PPB Crop: Wheat

PPB Overview: Scaling up three lines, two of which are further ahead, needs testing before approaching buyers. Possibly one year from beginning to discuss with buyers.

Case Summary:

General commercial goals:

- Sell to organic brokers
- Register a PPB variety if it performs well enough
- Free exchange/sale of seed amongst farmers

Scaling up production and testing in the coming year and will consider approaching buyers after that (if it tests well).

Currently sells through medium-to-large organic grain brokers as a non-identity-preserved organic wheat.

- There is a dynamic between premium and risk:
 - Higher premium, higher risk (often smaller buyers)
 - Lower premium, lower risk (often larger buyers)
- Organic market is flexible with registered variety requirement, but the organic premium is precarious for the farmer if top quality specs are not met
 - Buyers have relied more on quality specs from testing
 - Recent shift towards asking for variety name as quality assurance
- Sees room for identity preservation in organic, citing organic certification as a kind of identity preservation

Too early to say if/how he will commercialize

- Has not contacted brokers
- Has not investigated registration process

Commercialization process likely iterative and gradual

- Involves combinations of testing, trialing, approaching buyers/processors, and scaling up.
- Will continue if PPB line proves desirable

Not anticipating negative reaction from buyers

- Will be receptive if quality specs are what they are used to
- Buyers will require samples to carry out their own testing
- Shifting regulatory landscape (ex: dissolution of Wheat Board) creates uncertainty for PPB entering market
- Does not anticipate brokers/processors deriving extra value from PPB
 - Possibly at too large of a scale to leverage PPB identity for marketing

Barriers:

- Registration Barrier: Requirement of “Distinct, Uniform, and Stable” population to qualify for registration
- Uncertain about Bauta’s intentions, preparedness, and timeframe for registration
 - Will require credentialed plant breeder
- Uncertainty re: testing protocols and process: Where? How? Who can access? Cost?
- Purchaser risk: if brokers are dealing with much volume, they cannot risk uncertainty of quality
- Possible loss of organic premium if PPB instability causes loss of quality
- Opportunity cost of PPB storage while bulking
 - Beyond 40-bushel totes (vulnerable to rodents) a dedicated granary is required (2000 & 4000 bushel capacity)
 - If granary is not filled, this cuts out commercial storage potential for marketable grain
 - Difficult to justify without a clear opportunity to sell.

Suggestions and possible approaches:

- Responding to challenge of "Distinct, Uniform and Stable":
 - Possibility to register through recently added classes in grain registration system (ex: general purpose)
 - Establish new classes recognizing smaller volume or heritage lines for unique purpose and goals
- Mitigate risk in marketing and registration by collectivizing and slowly ramping up
 - Small collaborations (coop or otherwise) in any configuration of farmers, researchers, brokers/processors
 - Work on registration question
 - Pool product and collectively market
 - Align with dedicated broker to manage the initial small collective volumes of PPB and penetrate the market
- Used example of Red Fife as an unregistered variety in niche/specialty markets
 - Farmers and processors connecting
 - Appeal to distinct flavour and quality characteristics.

Researcher Comments:

Some combination of self-testing, buyer testing, and good performance will help to validate unregistered PPB varieties in larger 'broker' markets like #1's. Still, the ultimate determinant in crossing the threshold of commercial viability will be a buyer's willingness to take on an unregistered variety. This willingness and ability will vary greatly depending on a purchaser's context and capacity for risk. #1's thoughts on the collective production and marketing of PPB - especially the idea of a dedicated broker-buyer - could improve purchaser interest. It is a novel approach to PPB value chain development and could reduce risk for farmers and buyers.

A core question developing from #1's case is; when PPB selection is done, how stable is the germplasm? The answer to this question will affect registration, quality assurance, testing, and #1's ability to earn a

premium on organic. First, #1's reading of the "Distinct, Uniform, and Stable" (DUS) requirement of registration precludes the registration of unstable lines, and he perceived the evolutionary blend (a combination of all 43 PPB crosses) as "the absolute opposite of anything that is distinct, uniform, or stable." This is at odds with his hopes to register, and if farmers do wish to maintain in-situ development this also precludes registration.

Second, especially when selling unregistered to brokers, these brokers are going to require assurances of quality to feel confident purchasing a PPB wheat. If the end-use quality is not predictable due to instability, it will be a substantial deterrent to purchase. Third, testing will be the main quality qualifier for any unregistered PPB line. If the product is unstable, testing in one season may become irrelevant if the quality changes easily between seasons. Knowing the process, time, and quantities required for testing could create opportunities for testing smaller volumes more frequently to assure customers of quality. Finally, and related to the previous points, #1 noted the precipitous drop in premium for wheat that does not meet top-grade organic standards. Instability jeopardizes this premium.

Farmer 5 - ON

Farm: 170 acres

PPB Crop: Wheat, Potatoes

PPB Overview: Has achieved some traits he likes. Has not sold yet, but has interested value chain partners.

Case Summary:

General PPB commercial goals: Mill and sell as flour to current restaurant and baker partners. Sell as seed (potato and wheat)

Has not sold PPB. Maintains four wheat crosses and 25 potato lines. Potatoes are bulked and being tested. Wheat is almost at scale to be tested for quality and sold

Maintains close relationship with restaurant-bakers who are aware of and interested in his PPB participation. They are also in a position to leverage PPB identity. Maintains strong internet presence, noting popularity of products with unique genetic heritage

Marketing considerations:

- Successful commercialization will hinge on marketing
- May seek an exclusive sponsor of certain PPB products to penetrate the market and create interest/cache
 - Candidate sponsors (bakers, restaurants) are small enough to accommodate unusual or limited offer of a product. They can pivot and change menu quickly
 - Diversified offerings allow accommodation of organic/PPB price increase by absorbing cost in other products
 - Allows a platform of communication to consumers
- #5 could sell/share PPB with other producers but might choose to be exclusive seller for some time (at a high margin) to make back sweat equity
- Intends to keep PPB at a small enough scale to not create regulatory complications

Barriers:

- Opportunity cost: Seed breeding projects, and the possible work of PPB marketing, can take him from otherwise revenue generating activities

Suggestions and possible approaches:

- Must develop close, mutually invested value chain collaborations for PPB commercialization
 - Necessary for PPB to penetrate the market
 - Farmers and value chain actors must understand the role of those before and after them in the chain to properly mesh capabilities and requirements

- Develop new demarcations of scale and quality in registration to accommodate PPB
 - Similar to 2019 CFIA garden variety potato registration exception
 - Sets production limits but allows production
 - Allows the valuing of local/regenerative as well as the social role of unique cultivars
- Create online agricultural 'dating registry' connecting needs of producers and processors
 - Shows PPB producers/processors on the landscape detailing capacity, needs and requirements
 - Benefit from amalgamation and combined efforts while staying within regulations
 - Small processors connecting with small local producers
 - Small producers collectively meeting the needs of larger processors
- Develop matrix chart of PPB participant priorities
 - Ex: Difference between specialty producers seeking distinct flavour and quality characteristics and producers seeking strong agronomic performance but standard quality profiles
- Must reduce end-point cost of PPB (especially for small-scale niche producers)
 - Envisions arrangement in which he produces seed for scaled-up grain production in the prairies
 - That grain is shipped back to Ontario for milling at a lower price-point
 - May conflict with local grain production capacity

Researcher comments:

#5 has presented novel pathways and practices for PPB commercialization. Firstly, #5 identified the utility of value chain partners with diversified offerings to offset the price of PPB (organic) crops. He said that "because they're diversified my grain costs fit nicely into their cost of production and costs of scale." This comment highlights the differences in market flexibility between diversified and non-diversified value chain partners, and their ability to absorb the increased cost of PPB/organic goods. Restated; if a baker's main ingredient is flour, then an increase in the cost of flour necessitates an increase in the cost of bread. Inversely, if a restaurant purchases a PPB potato at a high price, there are still green beans, meat, and risotto on the plate that have not increased in price - therefore the more expensive potato does not constitute the entire offering.

#5's volunteer work as the miller at the Old Stone Mill National Historic site also raises interesting questions about the social capital of PPB. At the mill, #5 sells his grain at cost and mills for free. As an arena of social-educational interactions with the public there is an opportunity to educate and change the landscape re: consumer tastes and engagement, as well as to create social capital for the farm/farmer as educators, and to sell a value-added product. Opportunities such as this hearken to the socio-political roots of the PPB project and capitalize on it.

A novel offering from #5 was the idea of an 'agricultural online dating registry', connecting small-scale local producers and processors. This kind of arrangement would be accessible for PPB products at the same time as allowing for efficiency in selling and sourcing. It would be a landscape in which PPB could be leveraged, in contrast to other identity-lost arrangements or simply being barred from participation.

A final unique feature of #5's operation in the market that may warrant further investigation is his role as a seed breeder/producer/seller and how this interacts with his value chains. Does his seed breeding work change the collaborative value and his ability to respond to the needs of value chain collaborators? To what degree does this expand his range of capabilities as compared to other PPB participants? What does a 'close' value chain relationship look like for a producer who is further removed from the breeding process and more reliant on BFICSS for making changes to germplasm? Conversely, #5 may encounter difficulties with PPB as a "seed house" and should be aware of regulatory restrictions in this endeavour.

4. Status, Intentions, and Expectations for PPB commercialization

A subsequent goal of this research after the discovery of participant value chains was to determine farmers' progress, prospects, and perspectives on PPB commercialization. This chapter reflects on farmers' personal experiences and interests, outlining the array of options and approaches they consider. Section 4.1 reports on the status of active PPB commercialization, while 4.2 is more aspirational – exploring intentions and expectations for commercialization. 4.1 indicates the program's commercial progress and allows for the consideration of what is or is not working. 4.2 then considers viable futures and pathways for PPB commercialization - expressed by the people who are closest to the process and the intended beneficiaries of the program.

The following discussions about commercialization are mostly hypothetical and dependant on the production of agronomically promising PPB crops with good quality characteristics – a position that has not yet been solidified for most farmers. Almost all discussions of PPB commercialization are therefore speculative, and it will require more testing for agronomics and quality to move ahead in earnest.

“[It is] kind of hard to talk to people when you're still three or four years away from actually having enough”

– Farmer 9

Two additional topics are treated separately at the end of this chapter. They are commercialization as it relates to registration, and the unique elements of potato commercialization that have implications for PPB. Though this investigation focuses on the commercialization options available to unregistered populations, farmers still had ideas about registration that impacted their perspectives on commercialization. As for potatoes, they have specific agronomic and market features that distinguish them from grain and warrant separate treatment.

Some notes on this section

To better frame the following results, there remains some outlying information to be considered about the opportunities available to participants and trends in thinking about commercialization. First is the idea of the 'closed loop system' that is widely discussed by farmers and administrators. Then the role of participants changing their value chains to incorporate PPB material is discussed. Last in this note is the point of on-farm consumption as a use for PPB crops.

'Closed loop' is a term that is used ambiguously by farmers and administrators to describe PPB value chain patterns that circumvent the commercial grain handling and seed-regulatory systems. It does this by using dedicated value chains to move PPB crops from field to eater without interacting with the broader commercial system - maintaining full transparency of PPB material flow. There is a tendency to present the closed loop as 'any alternative to official registration', but as alternative market paths that do not require a closed loop emerge, it will be helpful to use this term for its specific meaning.

Participants generally do not consider changing their value chains to accommodate PPB crops. Any shift or establishment of new value chains for PPB would have to make clear financial sense, and at this point the value-added opportunities for PPB have yet to be clearly demonstrated. This principle also applies to the production of certified seed from PPB populations. As no participants are currently producing certified seed, they have not expressed an interest in doing so with PPB material. One participant has recently shifted part of their grain operation to a high-value direct market, which they anticipate will

facilitate their PPB commercialization. This change was not made to accommodate PPB however, and is notable more for the comparison it draws between small and large markets.

Finally, on-farm consumption is a PPB outlet which is available to farmer participants but is not widely considered. This would mainly be in the form of forage and/or feed for on-farm livestock. On-farm consumption was not included in the interview schedule and therefore received minimal attention in interviews. The possibility of interest in this use for PPB is extrapolated from participants' existing practices of feeding their livestock entirely from their own farms.

4.1 Status of PPB Commercialization

This section describes the progress of PPB commercialization and value chain development among participant farmers. It begins with the commercialization experiences of Farmer 3 and Farmer 6 who are, thus-far, the only farmers to have sold a crop derived from the PPB program. Comparisons are then made between small systems and large systems, ending with the notable case of Farmer 10 who is approaching commercialization through a possibly novel pathway.

“I think they've seen a great interest in the project because they love the concept, the idea of being self-sufficient, of food sovereignty on our part of the region of the country. They share the same kind of vision of what should be agriculture. So that's what makes us work together.”

- Loïc Dewavrin

“We don't know if the varieties we selected would even work in our programme. They were the best varieties that we could select with what we had to work with. Is it worth spending the dollars to get into the next step now? I would think that maybe would be a tough thing to justify.”

-Farmer 8

Examples of PPB Commercialization

Two producers (both small-scale) have successfully marketed a PPB crop – Farmer 3 and Farmer 6. Their experiences may hold important lessons in commercialization for the other farmers in the UMPPB program.

Farmer 6 successfully marketed his PPB Hard Red Spring Wheat in tandem with Marquis wheat in 2021 through his grain CSA, giving customers a choice between the two, and sometimes offering a mix of the two. His operation exists at a scale that does not interact with the commercial grain handling system, and he intends to continue producing his PPB wheat – known to him as the “Manitoba Cross”.

#6's Manitoba Cross was well received, with interest from his customers in its culinary potential as well as interest in the story behind the population. Customers are interested in both the genetic lineage of the population and the dynamics of plant breeding trying to be addressed by the PPB program. Further quality testing is still required, as well as the demonstration of longer-term agronomic performance - but early testing by CSA members suggests #6's PPB line is quite desirable for bread making. It is also versatile, and more palatable than his old standby variety Marquis.

Farmer 3 was pleased with his PPB potato populations. Though he no longer farms, #3 successfully marketed his PPB potatoes at farmers markets in BC in 2017. They were unregistered and unlisted, but they did pass food safety testing for glycoalkaloid content. He was also producing and selling at a small enough scale that he had no interaction with potato regulatory structures and was able to freely market his PPB potato lines.

#3's potatoes were well received by customers and had strong marketability - being colourful and visually appealing. He did not report specifically negative or positive customer reviews of his PPB potatoes for eating quality, but recalls them being of reasonable eating quality. He did encounter some poor reactions to the PPB story, with some customers automatically associating the act of plant breeding with Genetically Modified Organisms (GMO). It was clear that the baseline popular understanding of farmers and plant breeding was limited, and #3 found it initially challenging to describe the PPB origins of his potatoes in a clear, compelling, and understandable way.

"We tried to keep it pretty simple. Yeah, and just say "it's a partnership with the university to breed for organic." - which kinda wasn't totally true. And that seemed to work and most people thought that was pretty cool. And most people were curious enough to try it."

-#3 Richardson

His populations did not stabilize to the degree that he could reliably offer a potato with specific traits or end-use quality from week to week. This presented a challenge for properly naming, branding, and cultivating an interest in his PPB lines. He also found it challenging to come up with the language to describe the eating and cooking qualities of the potato, which was complicated by quality inconsistency. #3 could have marketed his PPB potatoes with a greater degree of confidence if he had the ability to test and describe his potatoes.

Progress in Large Systems

Larger producers have not yet commercialized their PPB populations, but some are approaching the beginning of this process. Commercialization is not uniformly appealing to participants, with some having more active interest and others simply waiting to see what comes out of the program. Most larger participants are awaiting the results of agronomic and quality testing and will proceed only when they are confident with the results.

There has been no official outreach to brokers or processors, which will be an early step in the yet-to-be-discovered path towards commercialization. Some participants have casually engaged friends and associated processors to make preliminary tests and weigh in on the PPB material, but the results of these communications are either pending or have been lukewarm.

Progress in Small Systems

Besides the two existing examples of commercialization, no other small-scale participants have commercialized a PPB product - though smaller farmer participants are generally closer to commercialization than their larger counterparts. Participants with smaller artisanal purchasers have made steps by communicating with their value chains and preparing them for the arrival of PPB crops and seeking buy-in. Farmer 5, for example, has a close partnership with Anthony Vieira from the bakery at 'The Restaurant at Pearl Morrisette' in Southern Ontario who is actively interested in the output of the PPB program. Farmer 2 also cultivated interest from several small bakers in Montréal shortly before his retirement, and hosted focus groups to test his PPB wheat.

The dynamic nature of small farms appears to facilitate this kind of early exploratory communication, especially with smaller and more nimble value chain partners who can more easily accommodate and derive value from alternatives such as PPB. Smaller farmers also benefit from a reduced lag time in scaling up volume to accommodate market demand when the time comes to sell their PPB product. The ability to pursue preliminary value-chain communication and ability to quickly scale-up seed volume put smaller producers in a good position to be the early commercializers of PPB crops.

Case of Note: Midmore Farms and Strathcona Stone Ground Millers

A case that could merit some attention for its unique PPB marketing possibilities is the value chain connection between Farmer 10 and the small/medium scale millers Strathcona Stone Ground – a connection that bridges the gap between small-scale production and larger market access.

#10 currently supplies Park wheat to Strathcona, and Strathcona has recently begun selling their products in Friesen Brothers supermarkets – a small regional chain with similar store size to IGA or Sobeys. If #10 succeeds in supplanting Park wheat with his PPB population, this will see a PPB population benefitting from the low barriers to market entry present in small systems but still accessing large consumer markets. From the perspective of increasing PPB market output, this is an opportunity.

Elaborating, larger PPB producers will likely encounter challenges with scaling up and finding buyers, yet once they succeed, their PPB crops will have access to relatively large markets. Inversely, smaller producers have lower barriers to entry but are typically accessing small markets. The steps from #10 to Strathcona to Friesen allow PPB to circumvent the variety requirements and regulations ubiquitous in larger markets yet benefit from the high volumes moving through more mainstream retailers.

This is not a perfect arrangement that is free of challenges, but it suggests two pathways for PPB to gain greater market share. Firstly, larger processors that are still small enough to not require registration could facilitate PPB entry into large markets. Secondly, regionally owned and operated stores at the scale of Friesen Brothers may have flexibility in sourcing -allowing for experimentation with and accommodation of PPB populations.

4.2 Intentions, Approaches, and Expectations for PPB Commercialization

Barring the few examples mentioned, commercialization remains aspirational for farmers and is accompanied by varied intentions and expectations. This includes varied levels of interest in commercialization. What follows is an overview of intentions and expectations for participants in small systems and large systems – scale once again being a convenient category by which to delineate and describe common approaches.

Larger producers approach commercialization (sans registration) cautiously - preferring not to approach or discuss with buyers until there is a demonstrable and testable product in demonstrable and testable quantities. They also anticipate slowly and strategically approaching buyers when the time comes, in a process that moves pragmatically between testing, scaling up, approaching, discussing, and selling their product. Despite the understandable caution, large producers still identify a spectrum of options and purchaser opinions for unregistered PPB offerings.

Smaller producers anticipate a wider range of options for distribution, especially because they typically encounter no regulatory hurdles in distribution. This is not to say that quality requirements are not important for purchasers in smaller systems - in fact they may be even more particular and stringent - but there are no technical limitations or requirements. Many participants at this scale envision supplanting or complementing their current varieties with their PPB offerings if the quality is good.

“There's tremendous opportunity in the food system to brand products that tell a story... more and more there's lots of consumers who want, you know, they want something with the story and a connection to farming. Or they want something local, or they want something unique, or you know, something that has a certain quality... And so those are all opportunities for us, if we wanted to pursue that, to try and develop that.”

-Farmer 4

“I think that the viability of commercialisation is possible, at least from what I know. If it's supported, if it's known, if we use the need that consumers currently have, I believe that it could become very commercially viable.”

-Farmer 7

Smaller producers

comparatively need to scale-up far less of their population to meet their production needs, offering a degree of flexibility for experimentation and less total loss if end-use qualities or the final crop does not meet expectations. Value chain partners in smaller systems are often enthusiastic about the quality and marketing potential of PPB and are more capable of absorbing and adapting to changes in quality.

“So I am fully confident that all of those customers that I’ve established the clientele with regular varieties of hard red spring wheat right now, that they will be really enthused by the story that comes with this process, with this PPB programme”

-Farmer 10

Large Systems

Larger farmers are more tentative and uncertain about their pathways to commercialization, though the current prospects follow similar processes for most farmers at this scale. Larger farmers foresee entering an iterative scale-up process with their buyers, involving testing, tentative discussions with a few brokers, broker testing, end-use testing, confirmation of quality, scaling up production, and approaching more buyers. The phrase ‘start small’ accurately sums up this process.

As long as there is no market value added for PPB due to homogenization, the only way it makes commercial sense for farmers is if it can compete with other varieties agronomically. This increases revenue through increased yield and the accompanying ability to sell at a competitive price. If it performs well enough, farmers could also benefit financially from saving their own seed.

Participants do not rule out broker/miller interest in unregistered PPB populations. Their value chain partners seem open to new and interesting opportunities, but they agree that merit and quality must be demonstrated first. One farmer noted that broker requests for registered varieties are increasing, but they are not ubiquitous by any means, and quality assurance is actually the main requirement. It is quite possible that even with quality testing results from the farmer, brokers will want to do their own testing too, to make sure their quality requirements are met.

“The goal is, I think, to produce a variety that yields 10% better than the best commercial varieties. So that 10% would easily make saving our own seed more lucrative for us, or better pay off.”

-Farmer 4

“I’m not expecting any sort of negative reaction from buyers, as long as the quality specs are what they’re used to.”

-Farmer 1

Brokers and processors are not a homogenous group and will respond to the PPB question in different ways. Favourable responses from more adventurous or sustainability-oriented actors will help to gain traction for PPB varieties and work as an initial testing ground for commercialization. What is common among brokers and processors is the unlikelihood that they will preserve the PPB identity along the chain. As it stands, most of these actors work on too big a scale to separate and preserve small runs of single-source grain, and it does not appear that they would change that to accommodate PPB lines.

"You'd have to find someone that's interested in the Manitoba-grown story - bred-and-grown story. So that's something we can work with. But that would probably be the only value because otherwise they're [buyers] gonna say, "well, organic wheat, there's lots of it around, and we're gonna get it cheaper."

-Farmer 9

"It's a big diverse market now, and there's probably opportunities on some scale"

-Farmer 4

Small Systems

Small producers do not anticipate regulatory restrictions for their PPB products entering the market, and are largely free to use their PPB lines in their current markets. The commercial benefit to small producers will come from good agronomic performance, good quality characteristics, unique quality characteristics, and the value-added elements of branding, identity preservation, variety history and the story of the PPB program.

Small producers aim to supplant or compliment their current variety selections, but they will not do this solely because they participated in the development of a population or because it carries an interesting story. For the most part, PPB will only supplant current 'go-to' varieties when they demonstrate superior agronomic performance in farmers' specific conditions.

As small producers bypass variety regulation, the success of PPB for farmers is tied to their success in markets related to local, resilient, organic, direct farm, and small-scale agriculture. An assessment of the capability of a farm in these contexts is also an assessment of their PPB commercialization potential. In this way, one's ability to sell PPB is the same as their ability to sell local and organic, and vice-versa. As an example, the size and availability of local organic markets will affect farmers' ability to leverage value from PPB identity by communicating the political and environmental implications of PPB.

Another factor influencing PPB farmer success in local organic markets is proximity to market centers which include rural-to-urban distribution nodes. Population density presents increased numbers of food-conscious consumers and limits reliance on 'middle men' - increasing the value retained from direct sales to processors like bakeries.

"[PPB is] a hook in a way... to help educate people about what public policy, public research can be, how public research can be adapted to changing financial circumstances - and that's what we see through Participatory Plant Breeding and how it can help build the community of agriculture."

-Farmer 6

"I think there is a desire among consumers. Yes, there is a market. I believe in it, that's why I continue to work in this direction."

-Farmer 7

4.3 PPB Potato Commercialization Overview

The potato seed and breeding process is quite different from grain for a variety of reasons that have impacts on PPB potato commercialization. BFICSS staff have thoroughly researched and explained the process for PPB potatoes, both for full registration and unregistered populations. This section draws attention to just a few additional points resulting from this study that may be useful for understanding PPB potato commercialization.

An underlying issue is that potato and potato seed producers are more dependent than grain producers on partners and institutions such as cloning labs for the maintenance and scaling of their populations. This is largely due to government and industry potato disease management approaches which result in tight interprovincial regulation on the movement of potato seed and the need to replicate nuclear seed stock every seven years to control viral load. This results in challenges for farmers to safely and effectively manage PPB populations independently.

"There's very few places in Canada that can do the cloning. You know, it's not everybody can do that. So you have to have a lab that can take those potatoes and start them, basically, like take them and start the seed process."

-Farmer 8

What unites PPB potato producers is that they are currently selling to the fresh market only - that is, there are no processors involved and they are not personally processing them either. This shortens the value chain and simplifies the PPB question regarding who will buy and sell these potatoes. Aside from this, the two current PPB potato participants participate in different markets. #8 produces potatoes for large organic markets. His potatoes are transported by rail and truck across Canada and the US, but they also make their way to some local retailers where the Fraserland name is maintained. Farmer 5 has reduced his role in the direct-marketing of potatoes for food and has ambitions to sell seed to home-growers.

Regardless of scale, participants identified the 'market entrenchment' of potatoes as a dynamic to be aware of in PPB potato commercialization. Entrenchment, as used by study participants, refers to consumer knowledge of, and desire for, a narrow range of varieties. Compared to grains that are seen as a more homogenous and fungible product with less variety interest for consumers, potatoes have more room to be sought after for their clear differences in appearance, texture, and processing outcomes. Entrenchment creates challenges and opportunities, allowing for greater consumer interest in potato properties, but also the risk of market-limiting consumer preferences for the familiar.

Farmer 3 experienced the duality of entrenchment marketing his PPB potato, where many customers were interested in his unique potatoes, but he was unable to repeat them due to quality variability.

“People know their potato varieties and they come to the market and they you know, they want a variety and you sell them that one year or one week and they want it again the next or they want to try something different. It's not really the case with grain”

-#3 Richardson

Alternatively, Fraserland Farms’ marketing of 'Pugly Potatoes' is an example of successful branding in which they tapped existing market interest in reduced food waste and succeeded in identity preservation. These examples make it clear that successful PPB potato marketing will require a consistent quality potato and creative communication to overcome entrenchment and penetrate the market. Potato producers remain ambivalent about PPB's ability to leverage a unique potato and the PPB story to increase sales.

A final shared interest of PPB potato producers is the investigation of smaller-scale options for population maintenance, where the challenges of population maintenance appear more suited to large producers as well as dedicated breeders and marketers. These PPB producers share a sense of responsibility to limit the spread of disease and ensure quality, but this is a still a much more involved process than PPB grain management. For this reason, the investigation of options for alternative small-scale or do-it-yourself propagation could be quite valuable in facilitating PPB potato commercialization.

4.4 Registration Overview

Though the registration process was not a part of this study, it still informs commercial considerations for PPB farmers despite its challenges. This section contains the discussion of registration so that it does not complicate other discussions about commercialization. The registration task team of the BFICSS has produced a thorough review of the registration process which can be consulted for more details.⁴

An efficient way to discuss registration for PPB participants is to think about how it is not being considered. Firstly, registration is not an interest for smaller producers who are perfectly capable of growing and selling their population without registration. They are happy to participate in a system aside from the conventional grain handling system. Secondly, for those at a large enough scale where lack of registration could impede their entry into the market, they will not seriously consider it until a superior or competitive population is clearly achieved.

UMPPB and BFICSS staff and administration should be aware there is still a mix of understandings and a desire for a clear pathway regarding the commercial outcomes of registration. This is considered more closely in the barriers chapter. One important factor under this umbrella is that there will likely not be plant breeder’s rights for PPB varieties. The commercial implications of this should be clearly understood, though many PPB farmers value registration for reasons beyond the financial gains of variety

“Whoa, no, why would I touch that?” [re: registration process]

-#3 Richardson

⁴ chrome-extension://efaidnbmnnnibpcajpcgiclfndmkaj/https://www.seedsecurity.ca/images/resources/Pathways_for_Distribution_and_Variety_Registration_for_PPB_Wheat_and_Oats_DRAFT_-_2021.pdf

ownership. A second factor is that registration exemption letters can be presented at the elevator in some regions – setting a precedent for the possibility of exemptions in other regions.

Producers should also understand the substantial challenges of post-registration market development. Primarily challenging is the multiple moving pieces and actors involved in market development. Time and expertise will be needed to navigate this terrain - cultivating buyer interest and scaling up accordingly. This will be especially challenging in small organic markets that have easy access to organic derogations and fewer channels for dispersal.

“There would maybe be a mechanism where he [a farmer] could access that seed down the road or get some recognition for developing that seed without having to put the resources that are kind of currently required into doing that”

-Farmer 8

Despite the challenges, some PPB producers are still interested in finding a way forward. Firstly, the notion of a handoff to a third party or collective for the purposes of commercialization is shared amongst some participants. This step would serve primarily to collectivize the strain and responsibility on individual farmers, as well as engage the specialization and expertise of industry professionals. It could involve farmers organizations as well as collectives of committed PPB producers and/or industry experts that see farmers accessing their seed and/or royalties at a later date. An arrangement like this could also do the work of crossing into conventional markets to stimulate the demand that would be lacking in organic markets.

Many participants are also aware of and interested in new pathways for heritage grains akin to the garden variety potato listing system, and BFICSS is already developing this idea through their registration task team. Though a very involved pursuit, this approach could lead to new registration classes that recognize smaller volumes and valuable alternative intentions, priorities, and purposes for variety development besides financial gain.

“Add a stream that would allow these types of certainly smaller volume products and uniquely distinct products to achieve their own recognition.”

-Farmer 1

5. Dynamics and Patterns in PPB Commercialization

Another goal of this study, as requested by the BFICSS, was to identify patterns and themes regarding PPB commercialization. This chapter synthesizes farmers’ direct experiences and identifies consistent underlying dynamics informing commercialization choices. These dynamics span the range of scales and orientations, forming a network of interacting considerations which can help explain farmers choices and inform further steps. All participants interact with these dimensions in their own ways.

The first section explores the interaction between product quality, variability, and testing – an overarching consideration that governs subsequent market development and processing decisions. Section two unpacks market development and value chain creation which are based on processes of communicating and collaborating with purchasers, cultivating market receptivity, and the challenges of

entering small or competitive markets. In many ways, market development refers to the relationships along the chain in production and marketing - with peers, collaborators, purchasers and eaters. In other ways it refers to the more abstract qualities of the market itself. Section three investigates marketing and communication, ranging from specific selling-points to a broader communication strategy, and the final section looks at the oft-cited example of Red Fife and Marquis wheat as exemplars of niche market development.

5.1 Interplay Between Quality, Variability, and Testing

The dynamic between quality, variability, and testing sits at the root of any further considerations of commercialization, especially for larger producers. These three factors overlap and influence each other and are part of the process of arriving at dependable and marketable populations and providing assurance to value chain partners. This dynamic is fundamentally related to risk management, and if it is engaged effectively, farmers will move to a point at which they can scale up production and take earnest steps toward commercialization.

Quality – Does it meet value chain needs?

Grain and potato quality are a main determinant of how and when farmers will move forward with commercialization. It is the main threshold to be crossed before it becomes acceptable to value chain partners, and must therefore be demonstrated through testing. Quality can refer to objective measurements of processing properties that are necessary for further processing and consumption. It can also refer to more specific qualities - special attributes that are less objective and more based on interest in unique products and flavour profiles. These specific qualities are more desired in niche and specialty markets, and so are more relevant to smaller producers.

"It's like it's either a number one very good quality that commands a premium, or it's feed."

- Farmer 1

Organic markets are demanding in their quality requirements, and the premium fetched by organic farmers can drop precipitously if quality requirements are not met. Attention to quality will therefore be even more important in PPB commercialization if populations are still dealing with genetic variability. Many participants have confidence in end-use quality based on the quality reputation of the parental lines used in the PPB cross. Parental quality appears to be a fair indication of end-use quality and could be assuring or attractive to purchasers.

The UMPPB program has already yielded some high-quality populations through farmer selection⁵, boding well for the continued refinement of yield and end-use quality. This, along with research by Iain

"I'm pretty confident in these varieties because I know Martin [Entz] said the parents of these are both kind of established lines"

-Farmer 9

⁵ Entz, M. H., A. P. Kirk, M. Carkner, I. Vaisman, and S. L. Fox. "Evaluation of lines from a farmer participatory organic wheat breeding program." *Crop Science* 58, no. 6 (2018): 2433-2443.

Storosko of Carlton University⁶ demonstrating farmers skill and capability in selection, indicates that populations are trending towards marketable and registerable quality. Indeed, some populations have proved to be of good enough quality that program administrators intend to enter them in the formal registration process.

Variability – Does it consistently meet value chain needs?

Variability, in this case, is the degree to which end-use quality characteristics can change in a population grown by the same farmer in the same conditions. It describes the level of uncertainty of end-use quality and is the inverse of stability. Farmers wish to provide a dependable product for which they can assure quality, as most processors and consumers require stability to predict the outcome of their processing. This allows the production of a consistent end-product for consumers, and repeatable/predictable processes that can be transmitted to employees. Testing for variability will thus allow farmers to proceed with scaling up and provide quality assurance to their customers.

Questions and mixed understandings about variability in PPB remain - some of which are considered in the barriers chapter. (Ex: What is the intended/expected level of variability in PPB populations?) Prominent questions include at what point a population is stable enough to be sold and scaled, and the cases in which variability is desirable. Farmers appear uncertain about when they can claim a population to be stable and if testing can confirm the year-to-year quality of their product, making it difficult to assure customers.

Farmers differ in their capacity to limit and manage variability in their crops, but have identified some approaches that facilitate commercialization. In terms of mitigating variability before marketing, farmers can stagger their crops - that is retain half of their crop each year to be mixed and sold with half of the next year's crop. This creates continuity between crop years by retaining half of the previous year's qualities and absorbing any changes from the current year's qualities. It will also help if purchasers and processors are willing to communicate about quality variability from season to season, which could be seen as an opportunity to strengthen value chain connections and add value for consumers. Lastly, some processors are small enough, or skilled enough, to absorb and even celebrate variability in crops, either by manipulating the crop components to achieve the desired quality, or by highlighting the unique qualities and flavours of each crop year.

“Once they have a product they want it stable. They want something that's repeatable which is easy to transmit to their employees... But also if you work with people who are kind of magician of baking, they can do whatever they want to the product that you give them.”

- Loïc Dewavrin

A final consideration to be aware of, as noted by BFICSS project partners, is that the variety registration system can actually accommodate small amounts of variability in heterogeneous populations - populations that do not produce completely homogenous or stable end-use qualities. Some markets can also accommodate this variability, the main condition being that the overall percent of variability remains

⁶ Jensen, H., Storosko, I “Evaluation of selection methods and efficacy in on-farm breeding of organic wheat and oat varieties.” Final report for *Organic Farming Research Foundation*, funding cycle 2019-2020.

stable through the years. This accommodation expands the points of entry for PPB crops into conventional streams.

Testing – Learning about quality and variability

Testing establishes the point at which PPB quality is good enough and stable enough to proceed with scale-up and commercialization. In this case, testing refers to end-use quality and is not about agronomic performance, but the stability and quality of the finished crop. It can refer to quantitative testing of the crop itself, like testing for the presence of disease, glycoalkaloid content in potatoes, and falling number in wheat. It can also refer to more qualitative processing trials in which the quality of the end-product is assessed. This section discusses the role of testing in the marketing of a population and participants' common understandings of testing. There is a general lack of clarity about the testing options available to PPB farmers, as well as its capabilities, uses, and the times when it is most appropriate.

"You'll need numbers, but they [purchasers] will also want to test it themselves."

-Farmer 1

Testing will be the main qualifier of unregistered PPB populations in the market, particularly for larger systems, and particularly if purchasers are trending towards registration. In other words, if purchasers cannot have the assurance of registration, they will certainly need proof of merit through testing. This may be an advantage if PPB populations have unique or desirable end-use quality and are entering markets that value these attributes. PPB farmers will likely want to offer this information to purchasers but should also be prepared for purchasers to request samples for their own testing.

Questions remain about what can be expected from the testing of heterogeneous populations. If the product is unstable, testing in one season may become irrelevant with the quality changing between seasons. On the contrary, if frequent and affordable testing is available, this might facilitate purchase based on the acceptance of and interest in specific quality characteristics. It may allow informed purchasers to choose PPB crops despite inconsistency from year to year. All of these considerations make it clear that more information is needed about testing - its capabilities, uses, required quantities, costs, and time requirements.

"Testing here is a bit complicated. I mean, we don't just send grain to the Canadian Grain Commission - they'd probably say, well, who the heck are you? that's a whole process and it requires brainpower and labour that I really haven't applied myself to."

-Farmer 6

5.2 Market Development

"It would only be a gamble if you tried to ramp up too quickly....[like to] produce 9000 bushels of something that you didn't have an existing market for."

-Farmer 1

After a suitable PPB population is developed and ready to be scaled-up, participant farmers anticipate the work of market development. This is not to say that entirely new value chains must be created for PPB populations, but that existing markets must become receptive to PPB products. Market development describes the substantive work of finding pathways and outlets for PPB products without which PPB crops would remain unused. This is differentiated from 'marketing and communication' which are the acts of promoting and branding PPB.

Some trends have emerged in participant considerations of market development which are explored in this section. Firstly, the theme of value chain solidarity is prevalent for PPB farmers, including relationship building, trust building, and collaboration along the value chain. Next, and expanding on this solidarity, is the more formal act of cooperating and collectivizing - intentionally using the strength that comes from groups, organizations, and partnerships to develop markets.

A final consideration is the approach that producers and program administrators will have to take to selecting markets and deciding how PPB can most strategically interact in the market. Rephrased; in a market dominated by large capital in which thousands of crosses move through a wide genetic pipeline, how can a few tenacious PPB populations find their way?

"If I thought there was an opportunity, and I had something that I thought they would be interested in, I think it would be a fairly easy conversation to have. Because most of my customers are, you know, they're interested in all kinds of different opportunities as well. Some may not be that interested, and others will be quite interested."

-Farmer 4

Value Chain Solidarity: Relationship and Trust Building, Collaboration

"I think that's part of the path forward for everybody that's doing it is to find a partnership and invest in them and get them to invest in you... to me that is the thin part of the arrow that needs to penetrate the consumer market to actually create this buzz or some sort of excitement or validation."

-Farmer 5

Marketing PPB starts with relationships. Participants spoke about contacting their grain brokers, bakers, and customers as the first step in finding a market. This was sometimes referred to as 'buy-in', and it involves reaching out to promising value chain partners to explain the PPB project and cultivate interest. Participants spoke about 'trusted' partners, starting with smaller and more nimble purchasers who would have the capacity to try something new. In general, these relationships start with a small number of partners and small volumes.

"Start with a small quantity, you will make tests of products of flour, and then you ship that to your preferred bakers, the ones you know they're able to develop something with that. And then you make them talk together about the product and you try to see if most of them like it or not. But at the same time you explain them where it's coming from and what you've done with that project and why [it is] important for you to pursue the project."

- Loïc Dewavrin

Values are important in these interactions, both for creating a sense of commitment to this project but also for adding value. Value chain participants, even larger brokers, are not a homogenous group and they carry values into their purchasing decisions. For this reason, PPB producers anticipate receptivity on a variety of scales from a variety of partners with overlapping values. Additionally, participants anticipate financial value for those who can preserve the social values behind PPB for end-point consumers who also have an ethical interest in their food sources. This potential is more easily available to smaller operations but is still attractive to larger ones.

Diverse values also lead to an element of discretion available to possible PPB value chain participants in deciding whether to participate. Nothing about PPB precludes it from unregistered markets, especially if it can demonstrate that it meets quality specifications. In fact, it may add value for purchasers. It is the relationships and trust within the value chain that can generate excitement and turn this discretion in the favour of PPB.

Cooperation and Collectivity

Expanding on the idea of trust is the possibility for more official and intentional arrangements between producers, value chain actors, industry experts, and maybe even consumers to bring PPB to market. The word ‘cooperative’ is used in different ways – describing different purposes and levels of involvement. But there is a common thread; that participants see benefit in marketing together. This serves to minimize risk, collectively problem solve, combine volumes, and combine marketing power.

Cooperative arrangements can be simple, like program-internal agreements allowing for the free-sharing of germplasm within the UMPPB program. These arrangements can also be more intricate, involving the pooling of the initially low volumes of PPB to meet the volume requirements of a single dedicated broker. If low production is a barrier to marketing, one producer also suggested the cooperative production of PPB crops through the sharing of time and equipment. This is more practical for geographically close participants but adds an element of diversification without having to commit to producing large volumes too early.

“I would need smaller equipment or sharing with other farmers, equipment that could go around... I believe that it could become very commercially viable for these populations. If we give the chain the means to organise itself, in terms of production, I think that commercialization would be possible for these populations.”

-Farmer 7

It should be noted that there can be a cost associated with co-operative activities (i.e. administration, consultation, professional/technical assistance) and this can be a barrier to farmer participation – especially when they have already invested substantial time in selection, bulking, and storage.

“I could say, ‘hey, I’m gonna buy a variety of oats from somebody else who’s been in the PPB programme’... I can grow his or her variety of oats that they selected for this area, and I will grow that small scale... maybe I buy it, maybe I trade him or her for wheat that I’ve developed, right?”

-Farmer 10

Direct competition in a numbers game

The modern crop market makes thousands of varieties available to farmers, all of which were selected from an even wider pool of candidate varieties. This is a competitive market for PPB crops that are ready to be commercialized, competing both with existing varieties but also a wide and continuous genetic pipeline supported by massive capital and technical ability. Approaching this market context with one or only a handful of populations, therefore, stakes a lot on those few populations. BFICSS and UMPPB will have to approach this dynamic strategically - understanding their markets as well as the capabilities, advantages, and requirements of PPB in these markets. The question that arises, then, is what advantages are conferred on participatory populations that can make them competitive in the market or segment the market and find an effective niche.

The market advantages of PPB depend partly on the market intentions of the UMPPB program and its participants. If competing by standard measures of performance (i.e. yield), the question is if UMPPB can succeed in producing an agronomically and qualitatively superior product by consistently tweaking and adapting a population. Conversely, some participants seek different indicators of 'performance' based on organic and regenerative principals such as their impact on soil health, carbon sequestration, or consistency before yield. Finally, if UMPPB wishes to compete directly with the conventional genetic pipeline, it might consider drastically increasing the number of

"That's why big companies want a lot of money for breeding, because there are, for every one success, they might have 10 failures."
-Farmer 9

"We are looking at this small number of crosses in the way we're doing it. [So] compared to the scale at which they're doing it, they're gonna have a lot more potential matches to select from and probably have a better chance of developing stronger varieties."

-Farmer 8

participants, thereby increasing the total germplasm moving through the program. However the program proceeds, it should be factoring in discrepancies in genetic volume and the options available given this discrepancy.

On-Farm Transformation and On-Farm Processing

PPB market development will be influenced by farmers relationships with, and ability to process their PPB crop. Self-processing expands the range of markets that PPB crops can enter, both by increasing the range of products offered by the farmer, but also by allowing access to markets which otherwise would have contained registration barriers for the unprocessed commodity. As smaller farmers are already largely unaffected by registration, the benefits of self-processing for circumventing regulation are mostly available to larger farmers.

Wheat milling is the only active example of on-farm crop transformation from this study, with multiple farmers milling wheat at different scales and in different ways. Participants with on-farm mills are well positioned to work with PPB wheat. They are in control of their distribution systems and have pre-existing flour markets. It becomes the farmer's prerogative whether and how their flour will enter the market and whether their customers will even be aware of the PPB origins of their flour. This contrasts with the selling of unprocessed PPB wheat to processors who may be deterred by an unregistered population.

As an example, a supermarket could carry flour from a processor that would not accept unregistered PPB grain, but at the same time it could carry a self-milled PPB flour that was not subject to registration requirements. Growing and transforming avoids negotiating the sale of an unregistered wheat; the farmer adds value, circumvents registration, and controls the narrative surrounding their product. By this means, the product moves closer to a discretionary point at which purchasers can buy based on demonstrated quality, word of mouth, or relationship with producer – not just registration status.

The obvious drawbacks of this pathway are the entry requirements of self-processing: equipment and knowledge acquisition, time requirements, and the establishing of new processed product markets. One solution to these barriers is for farmers to use outsourced or custom milling in which a miller is hired by the farmer to process their wheat. This approach was not thoroughly discussed or seriously considered, but it could allow large and small PPB producers to produce flour without equipment purchase and maintenance.

5.3 Marketing and Communication

Upon arrival at a marketable grain or product, both will enter competitive markets in which their benefits and potential must be communicated if they are to become as appealing or more appealing than pre-existing options. PPB populations will have to be marketed both to bulk buyers and processors as well as endpoint consumers. Insofar as increased PPB participation strengthens the program's commercial viability, administrators should also be considering ways to market the PPB program to other farmers.

This section unpacks components of marketing and communication, starting with the general challenge of identity preservation and then moving on to the more specific marketable features of PPB considered by participants. It then explores the need for a communication strategy and the possibility of assisting farmers with PPB marketing.

"Participatory Plant Breeding doesn't exactly roll off the tongue... branding is something that as the programme develops, will be essential for the marketing. And it's only the marketing that's going to make people interested, I think"

-Farmer 6

Communication and branding around PPB

"People are so familiar with varieties for potatoes... that probably would require, yeah, a pretty good spiel to convince your sellers to actually take it"

-#3 Richardson

"Ultimately, the success of it, I think, is about marketing, and having an interesting name or a compelling story is really a critical component."

-Farmer 5

can be an important point for adding value for farmers. All the small farmer participants in the program have considered the marketing potential for PPB to some extent and believe in its ability to make their wheat more saleable. It can be simply 'a good wheat' or its special characteristics can be leveraged to make PPB an attractive option to consumers and add value in the value chain.

Identity Preservation: Leverage PPB or not?

Identity preservation (IP) is the main value-adding component of PPB for farmers beyond values-based variety selection and good agronomics. In other words, if the crop is not communicated as PPB, its economic benefits are limited to 'just being a good crop'. IP in this context refers to the preservation of PPB identity in crops along the material flow of the value chain. It can be preserved all the way to the end-point consumer, or it can be preserved up to a given point in the value chain. Farmers consider or don't consider PPB IP for numerous reasons, but their choices are related to scale and pre-existing IP practices. Farmers also reflect on the work requirements of IP - their capacity to do the work of IP and who can be expected to do the work.

A helpful continuum for considering the practicality of PPB IP in markets is between fungibility and non-fungibility. Highly fungible markets take in the same product from different sources and result in a homogenous or generic output that obscures the diverse origin of crops. Non-fungible crops have unique origins, features, and backstories that make them difficult to swap out with other generic products of their kind. Fungibility in markets makes IP more challenging and larger markets are often more fungible, making IP less appealing or sensible to larger farmers.

Larger farmers participating in fungible markets do not intend to change their practices to preserve PPB identity - though they maintain some openness to opportunities should they arise. PPB IP is more accessible to small farmers who are already preserving identity and already have a clear line to their customers. Preserving PPB identity is attractive to these farmers as they believe the function and story of PPB will be attractive to consumers. It is in line with concepts like eating local, farm to table, slow food, and terroir which have made their way into the popular consciousness. These farmers believe PPB will be attractive to consumers who actively support alternatives to a food system that is perceived to be deeply corporate and harmful.

Though many smaller farmers are already engaged in IP in their markets there is still work to be done for the PPB identity to be leveraged. Program administrators should have a clear understanding of how this work will get done and who will do it. The possibilities for collectivizing the PPB identity are interesting to some farmers - branding and approaching IP in some collective fashion - but this also takes work.

Marketable Features of PPB

In a competitive market with thousands of grain and potato varieties, PPB farmers and administrators must find ways to make their populations stand out to purchasers. Every participant farmer has some sense of what would make a PPB population marketable and how they would approach marketing. First, the social aspect of PPB participation can be leveraged to increase program visibility among farmers, purchasers, and eaters. Second, the social and ecological benefits of the PPB approach can be engaged. Lastly, the unique qualities of a specific PPB crop can be marketed.

The collaborative and cooperative nature of PPB participation is an attractive feature to many PPB participants - both for the collective development of organic germplasm, but also for the camaraderie and social appeal of belonging to a group. This can be leveraged to indicate that PPB is not an isolated practice but something of a movement, and this perception can increase

appeal in the market as well as for potential participants. Farmers don't want to exist in isolation or see themselves as the only one engaged in a particular practice. Belonging to the PPB collective lends credibility to this activity and can create brand strength beyond what an individual producer could muster.

Participatory breeding is often undertaken for social and environmental reasons, and these benefits can also be highlighted in marketing. Socially, growing public awareness and dissatisfaction with large corporate agricultural interests has made a space for the appreciation of farmer empowerment and knowledge reclamation offered by PPB. Participatory breeding also offers opportunities to educate and engage other farmers and eaters about issues in plant breeding, which is both socially relevant and important for publicizing the story of PPB.

Continuing with the social benefits of PPB, participants related PPB to entwined concepts such as food sovereignty, seed sovereignty, self/inter-sufficiency, and short food chains. These concepts have been

“That would be extremely valuable, knowing that what people are buying is part of something bigger - that it's not just about one farm, it's about a cooperative venture”
-Farmer 6

“I think we should capitalize on the idea that self-sufficiency is very important for food sovereignty. With problems like we had this winter, for example with the Suez Canal or with the strikes on the Montreal port, or other kinds of problem like that with COVID, I think it's more and more important to think about that, with the value chains that we developed, it has to be stronger than that, or we have to find ways to work on these topics. And this is part of it.”

-Loïc Dewavrin

further entrenched in the public through recent experiences with COVID-19 and related supply chain interruptions - highlighting the fragility of the struggling and often harmful globalized food system. Eaters are interested in being involved in an alternative to this food system, and new modes of germplasm production can be placed at the root of these new systems. Farmers therefore anticipate consumers responding well to 'locally' derived germplasm.

Environmentally, the possible benefits of PPB are numerous and can also be an attractive quality to conscientious eaters and farmers. Participants highlight the benefits of varieties that require less inputs and that are adapted to the land on which they are grown.

"I don't know what the parents, the genetic history of this cross, was. But I will definitely get that and provide that as part of a marketing plan."

-Farmer 10

Beyond the implicit benefits of participatory breeding, some farmers discussed marketing their PPB crop based on its unique traits such as eating, processing and cooking quality. Primary examples include flavour, texture, colour, millability, and baking quality. Other examples of unique and marketable traits beyond eating and processing quality could relate to good agronomics, long shelf-life without preservatives, or even the high content of certain minerals in some cases. Participants can also engage growing consumer interest in unique crop varieties and genetic history by drawing attention to the parental lines used in their PPB population.

"Having something that's been born and bred on a farm, I think that could be something that from a marketing point of view could be leveraged for sure. And I think people this day and age, they like to know where their food has come from and that it's pure and you know, Canadian - all that stuff. I'm sure that could be part of the story, maybe."

-Farmer 8

Communication Strategy

A communication strategy organizes the previously mentioned IP and marketing approaches to bring intentionality and cohesion to PPB commercialization. This may be a useful project for BFICSS staff as it is work that could be well-served by centralization, so farmers don't duplicate efforts. This subsection unpacks a handful of features that may be relevant to a communication strategy, including physical branding, framing and storytelling, and modes of communication.

Many farmers recognized the importance of the physical branding of PPB - some despite their distaste for the more profit-driven trappings of self-promotion. Physical branding is the act of making PPB recognizable through a logo, a slogan, and possible physical items to accompany it – much like the marketing of fair

"There's a story there, and it's a very interesting story and it's a very compelling story, but it's complicated and it takes time to describe."

-Farmer 6

trade or organic products. Physical branding items could include stickers or banners for farmers markets, for example. At the same time, materials like brochures, and web resources should be accessible and appealing to consumers and farmers who may consider participation.

There are also non-tangible aspects of branding that need work, such as considering the framing of PPB and how the story is told and communicated. This is how consumers and farmers are informed of what PPB is and why it is worth supporting. An example is how the group dynamic of the program can be leveraged to indicate that PPB is a collective enterprise and a movement. It can indicate that PPB is considered worthwhile by a network of farmers, as opposed to individual farmers advocating for their PPB populations on an individual basis. Consideration can also be put into how the story of genetic heritage is used and how this can be merged with existing narratives of heritage that have been developed around Red Fife and Marquis wheat for, example.

"It would be worthwhile, I think, to use social media, to make this program known, because it's not well known... especially there are people I think, young people, that would like it... it would help the programme a lot, to have a communication strategy so that it is known, so that people ask questions, then participate, take the first year to join the programme, then if there are more people who join the programme, people will talk to each other, they will find solutions. Because they are producers and producers, at some point, find solutions when they talk to each other."

-Farmer 7

For both physical and non-physical branding, modes of communication should be an overarching consideration. Online communications are important for most participants, and small farmers in particular are already adept at the use of social media to communicate to their customer base. This combined with ubiquitous internet engagement in the general population suggests the need for a clear web strategy. Farmers should also be able to speak effectively to the benefits of their PPB product. Some have experimented with different ways of talking about PPB to customers and consumers, but for those who are not adept at 'selling' a novel product, some tips on communicating about PPB effectively could be useful.

Assistance in Marketing

All of the aforementioned communication steps take time, energy, expertise, and often money. These resources, coincidentally, are often scarce for farmers and so many of them have communicated a need for assistance in these endeavours. Assistance can come from inside the program - from program administration and support staff - and BFICSS can also play a role in coordinating external marketing support and expertise, both paid and unpaid.

"I myself feel this need. I myself don't have the skills at this level, or there aren't many people who can help these producers. It's certain that consultants in this area could be developed."

-Farmer 7

Assistance in the areas knowledge and storytelling around PPB would enhance the potential for PPB to connect consumers and politicize them regarding issues of plant intellectual property, seed sovereignty, and food sovereignty. If participants are to pursue identity preservation it will become increasingly important that they are equipped with the knowledge and talking points that would make PPB attractive or allow them to sell at a premium.

Some do not see the need for marketing assistance and believe that only the farmers have a clear enough understanding of their markets and value chains to make effective decisions in this regard. Similarly, others consider that PPB marketing experience shared between farmers would suffice, and likely be more relevant than information and assistance passed along from a central body.

"There's no little one source of information link that I can send people to. If there were, then it'll be that much easier and I'd say, 'this is what it's all about, go to that site and educate yourself.'"

--Farmer 6

5.4 Working from Examples: Red Fife and Marquis Wheat

Almost all participants referred to examples of niche market development in their consideration of PPB commercialization which could provide blueprints for successful commercialization. A common example is Red Fife wheat, which is a heritage variety currently enjoying a resurgence in popularity among consumers and which has elevated popular interest in crop variety. Marquis wheat has also become popular, having been featured by one participant in a television documentary, as well as garnering moderate attention online. That PPB participant (Farmer 6) is currently growing Marquis for an enthusiastic clientele. These examples prove that pathways exist for branded/niche populations with preserved identity and that there is significant consumer interest.

Valuable lessons can be learned by investigating the development of these markets through research and by connecting with PPB participant clientele who are already working with branded products. One participant suggested a preliminary point to be taken from the Red Fife example, which is the importance of seeking buy-in and support from all levels of the value chain. This and other considerations can help

UMPPB administrators and farmers avoid ‘re-inventing the wheel’ and anticipate pitfalls in the commercialization process.

6. Barriers: Risk, Hurdles, and Gaps

Any intentions and well-organized steps towards commercialization still encounter barriers, which are the subject of this final section. Among the barriers facing PPB commercialization for farmers, risk is an underlying and persistent factor. Especially when working with unproven end-use quality, farmers could be jeopardizing relationships and their economic well-being if they decide to proceed with commercialization. Farmers and value chain partners are unlikely to gamble on PPB for ideological and political reasons, therefore risk must be mitigated.

Beyond the fundamental issue of risk, the ‘Hurdles’ section refers to challenging stages and bottlenecks that must be overcome or addressed to proceed with commercialization. These are related to regulations, market dynamics and on-farm practicalities. Lastly, ‘Gaps’ refers to missing information. These challenges are largely internal to the program, consisting of unknown variables as well as divergent understandings of concepts and commercial intentions within the program.

6.1 Risk

Risk is an underlying factor in the following sections and is present in a variety of forms when considering PPB commercialization. Farmers are unlikely to proceed if they feel they are taking risks, so risk mitigation is crucial. Firstly, farmers refer to the gamble of investing time and energy in the production of an agronomically agreeable population that could turn out to not meet end-use quality requirements. Most farmers are already taking this risk, and the implications are that they might not see returns for their investments of time and energy.

“We're eight or nine years in and I mean, we've never even gotten enough money back out of it for fuel, let alone labour and stuff.... if it isn't any good, or if it doesn't meet somebody's specs, I mean, that's the risk.”

-Farmer 9

Risks become more substantial when farmers look to commercializing and involving value-chain partners. Scaling up to marketable volumes requires confidence in a population, and if quality is not guaranteed, farmers risk delivering an inferior product to value chain partners. (Not to mention being left with large quantities of unsellable crops.) This can create complications regarding who absorbs the losses and can undermine value-chain relationships and customer confidence.

“After that [agronomic success] you have to see if what you've done is good for food.”

-Loïc Dewavrin

Fragility of organic premiums also means that the risk of taking financial losses based on small decreases in quality is high, magnifying the risk posed by genetic instability and the resulting quality uncertainty. The following hurdles and gaps must be addressed to mitigate risk, which will be pivotal in creating dependable value chains, creating a comfortable situation for farmers to proceed, and lowering the risk threshold to a point that it makes sense to commercialize.

6.2 Hurdles

'Hurdles', in the context of this study, refer to the social, technical, and economic obstacles that must be overcome for commercialization to proceed. They can largely be considered as external factors, beyond the direct control of farmers and program administrators. Hurdles are distinct from the 'gaps' discussed in the following section, which can be considered as program-internal factors relating to information and communication. They are grouped into two broad categories - scaling up, and market development challenges.

One hurdle which does not fall easily into a category exists for participants in Quebec. This is the requirement that they use registered crops to be eligible for crop insurance and various programs. The extent of these restrictions is not clear from interviews, but there appear to be work-arounds available based on the centrality of specialty crops to a farmer's operation.

"If you wanted to apply for funding programs, federal programs, provincial programs, you had to buy seed from a recognized seed company and then [get it] tested."

-Farmer 7

Scaling Up

Scaling up is a consistent multidimensional challenge starting in population development and extending into commercialization. Significant volumes are required for agronomic and quality testing, for purchaser demonstration, and for marketing in sufficient quantity, but there are risks and challenges involved with scaling up to these volumes. First is the difficulty of scaling up without being certain of quality, while being unable to test for quality without sufficient quantity – presenting a paradox. Scaling up also requires the investment of time and resources and is affected by scale in other areas such as farm machinery, value chain processing capacity, and market scale.

A central paradox in the pursuit of desirable quality characteristics is that testing for quality requires large quantities of grain, but the production of large quantities of grain is difficult to achieve without investing in the scaling-up of a population. It is difficult to test when a population is not scaled up, but participants are hesitant to scale up if the population is not quality tested.

"You have to increase, also, what you grow to be able to test - so that's a big concern."

- Loïc Dewavrin

Scaling up also requires the investment of time and resources.

There are opportunity costs for farmers whose attention and land are diverted from their revenue generating activities in the pursuit of an experimental and not-yet-lucrative project.

Participants may also be asking value-chain collaborators for their time, input, and patience in meeting volume requirements.

Lastly, a deceptively simple challenge is storage. PPB populations, which must be stored separately from other varieties, can occupy

storage space or require new storage that otherwise would be taken by marketable crops. Especially when a small amount of PPB material ties up a large storage unit, this can be problematic.

Finally, scaling-up encounters other scale-related barriers related to farm-size, equipment, and markets. Scaling up is more challenging for large producers who have a harder time pivoting and are slower to reach required sale volumes. They encounter the perennial PPB challenge of equipment scale - that is

bridging the jump from small plots to large in an efficient way. Knowing when to proceed with this jump is challenging and informed by the preparedness of markets and partners to absorb the jump in scale. An example of this is the limited occurrence of larger-scale yet still-local milling that would sit somewhere between small artisanal mills and large industrial mills.

Market Development Challenges

Market development, or the cultivation of market receptivity, acts as a gatekeeper to PPB entering viable and dependable markets. Without customer interest, buy-in, open channels, and partnerships, a scaled-up population may never leave the bin. Participants identified several challenges for creating these conditions, many of which require time and money. One type of challenge relates to existing market features such as easily accessible organic variety derogations and competition from well developed European markets. Another area of challenge is about low awareness of plant breeding issues in the general public, as well as low awareness of the UMPPB program specifically. Finally, farmers may encounter issues in the time lag between the growth of market interest and the ability to supply adequate volume to meet this market interest.

Pertaining to market features, the ease with which organic farmers can access organic derogations from organic seed requirements is a challenge. Official organic production in Canada requires the use of certified organic seed, but because organic seed offerings are limited, farmers can receive exemptions from this requirement (known as 'derogations') with relative ease. There are also many productive non-organic options in the market,

so these factors combine to reduce demand stimulus for new organic population. Interviews also indicated the presence of well-established, efficient, and well-resourced European organic seed markets, and that is the second market challenge. Existing organic breeding programs can make it difficult to enter the market, and this will elevate the importance of emphasizing unique PPB features like farmer empowerment and adaptability in PPB marketing.

Finally, there is work to be done regarding awareness and popular understanding of PPB and plant breeding issues in general. For the UMPPB program specifically, farmers indicated a need for broader outreach and communication about its purpose and benefits. This can attract further farmer participation to strengthen the program, increase the appeal and understanding for value chain prospects, and stimulate consumer demand for the products of this important breeding method.

"If I can get to a level of having enough wheat, then it's a matter of 'does some mill want it?'"

-Farmer 9

"We save our own seed in some cases, but it makes more economic sense to plant pedigreed seed rather than selling higher value organic seeds."

-Farmer 4

Participants also indicated a low baseline of popular understanding about the role of crop breeding in agriculture and the social and environmental issues that accompany it. One participant with experience selling PPB potatoes noted positive reception from people who had knowledge and interest in crop breeding. Contrarily, they also noticed hesitation from customers who either misunderstood the function of crop breeding or conflated PPB and Genetic modification.

Both examples will likely require a concerted effort for maximizing the impact and distribution of PPB.

6.3 Gaps

Whereas other barriers are based in specific tasks and steps, there are barriers that stem from a lack of clarity and lack of knowledge in key areas. Gaps fall into two categories. Firstly, there are knowledge gaps, including unknown context-dependant variables like purchaser requirements and specifications. A second category of gaps is divergent farmer understandings of key factors, such as testing and the overall expectations of varieties - both agronomic and regulatory.

6.3.1 Knowledge Gaps and Context dependant variables

These are the barriers formed by unknowns – gaps in the understanding of commercialization that either need to be filled, or can't be filled until further steps are made toward commercialization. Within the UMPPB program there is uncertainty about the supports available to participants for moving into the market. This includes a perception for some of not knowing who is available to offer this support in a climate of shifting program staffing and partnership.

Outside of the program, PPB producers – especially on the larger scale – have not approached possible value chain partners, and therefore lack an understanding of purchaser requirements. Purchaser requirements include the possible requirement of variety name, testing requirements, and quantity and consistency needs. The answers to these questions will be context dependant and vary from one purchaser to another. Commercialization will be bolstered and better understood when experience is gathered regarding the common features and attitudes of the value chain.

6.3.2 Divergent Farmer Understandings of Key Factors

It became apparent in interviews that farmers understand and approach key factors in commercialization differently – a divergence that would best be addressed so that participants and administrators can align their expectations and 'speak the same language'.

Differences in understanding undermine some important dynamics which were discussed in Chapter 5. The role of testing and the opportunities available for testing are one point of divergence, followed by an internal tension between the goals of adaptability and stability of populations. This tension informs a spectrum of beliefs regarding what a participant can expect agronomically and commercially from their variety.

Testing

Questions remain about the process and capabilities of testing in unregistered populations. UMPPB has engaged in quality testing, but it appears farmers could benefit from further clarification on this process. Resolving this uncertainty would bolster confidence in scaling up and proceeding with commercialization. Nonetheless, this bridge may have to be crossed when participants get there, and it may look different depending on specific context and purchaser.

"I'm not real sure of the protocols for getting baking tests done by the Canadian Grain Commission... if anyone can just pay to have them do sample baking runs with the grain? I guess that's something that we would have to figure out as well when we get to that point."
-Farmer 1

Regarding the capabilities of testing, farmer questions include: What can it demonstrate, by what metrics, and what will that mean to purchasers? What is the use of testing, and when is it best employed? A more specific question is about the ability to test individual crop years. Is this possible? Does it allow for farmers to make claims about quality or market a product based on specific quality characteristics?

"This is where I was expressing, like, hey, there would be an opportunity to still stay at the plot size and do some more selection. But I haven't found guidance on how I would do that based on visually doing selections. If it was for something that was about taste or about the millability - the milling qualities of it"

-Farmer 10

Additionally, participants were curious about other means of assessing quality. Can it be done quickly and in small quantities? Can it be done earlier in the field or during selection to have some assurance before scaling up? Perhaps there are some stand-ins for official testing or early growth properties that signal the qualities of the fully matured crop.

One major point of clarification is the process of testing, which encompasses questions about where and when it should be carried out, as well as by-who and the requirements for testing.

How much volume is required? What does it

cost? Who bears the cost? What are the steps, and at what stages are they taken? When trying to answer questions about stability, it would also be helpful to know how frequently PPB populations will need to be tested. Should it be part of long-term testing to have validity, or is one-off testing of a crop year adequate? Answering these questions and making sure farmers are fully informed about the choices available to them will ensure that commercialization proceeds optimally.

Expectations of PPB variety and understanding of UMPPB goals

Farmers have divergent understandings of the long-term intentions for PPB germplasm which have an impact on their commercial decision making. The main distinction that can be made is about the static or fluid nature of the germplasm pipeline moving through the program and how long they can expect to use their lines.

Some farmers see UMPPB as a continuous process of selecting, refining, and adding to organic variety options - allowing them to change to optimal varieties as their old ones lose efficacy in the field. Others envision keeping and maintaining their final populations, which will continue to add value over time or as their populations come to be known and desired more broadly. If indeed participants lines will lose efficacy over time, participants should be aware of this as it will change the appeal of investing in the germplasm itself, and the branding around it.

“An ongoing process of breeding, selection, evaluation, and adoption... [that] should probably never stop.”
-Farmer 4

A related question is if participants continue selecting regularly for their population or if they ‘graduate’ out of the program with a ‘finished’ population. This may have implications for value chain collaboration.

“Potential benefit from growing a crop that has more genetic diversity before it gets fine tuned in the late stages of the plant development to become a registered variety. Why don't we just plant one species that has more genetic variability? And that landrace production concept provides a natural resilience in the face of climate change.”
-Farmer 10

Given the inability to adjust for specific end-use quality characteristics, participants rely on the selection of good parent material to pursue quality. Value chain collaboration will thus be more long-term if the pursuit of specific qualities requires some trial and error as well as ample time for selection. Collaborations may also have to be based on different premises, such as exclusivity, and partnerships in market development.

Tension between adaptability and stability

Farmers understandings of stability will have to be clarified for them to make choices about the level of stability they desire from their population, and to make choices about PPB marketability. A farmer requiring stability should not find their population becoming unstable just as they begin to court buyers. Inversely, a farmer that participates because of an interest in adaptability should not find that their population is actually ill-equipped to adapt to the changing needs of their environment.

The genetic stability of the final PPB selections is perceived by some to be fluid, and others to be rigid in terms of consistency of agronomic and end-use qualities. Some farmers work under the assumption that they will arrive at a consistent population, whereas others understand and appreciate that there will be continued evolution/adaptation in their fields and appear to be prepared for that. There may also be a discrepancy between adaptability in agronomic performance and consistency in end-use quality. In other words, it is poorly understood by farmers if agronomic variability directly correlates to quality variability.

"One of the phrases that is still used by the registration process is 'distinct, uniform, and stable' - DUS. Well, when you got 43 different lines all in the same mixture, you have the absolute opposite of anything that is distinct, uniform or stable."

-Farmer 1

The desire for stability is mixed, with larger farmers requiring greater stability and smaller farmers having greater interest in (and capacity to respond to) in-situ genetic evolution. If any farmers were to pursue registration, stability is part of the requirements that a variety be distinct, uniform, stable, and new. Larger producers selling to brokers (even unregistered) also trend toward stability for the mitigation of risk in large purchases, as well as for the demands of product consistency in larger markets.

Smaller producers, conversely, have discussed the attractiveness of adaptable populations both for agronomic resilience and for the benefits of being able to market the adaptability 'story' of PPB. Customers of small producers are also more likely to have the knowledge and interest in adapting their processing, which increases their ability to absorb the quality changes brought on by instability.

Registration and IP

"I think the way it was set up is the crosses were given to the growers, they could grow it, and then they would have the option to retain the rights to those genetics and commercialize it."

-Farmer 8

A final point at which farmer understanding diverges is on the rights to the germplasm coming out of the UMPPB program - how they are assigned, who has access to it, and who benefits from it. Some believe it is open source by nature, while others understand there to be opportunities for royalties and ownership if a suitable population is developed. Some do not wish to own their PPB population, and others see this as a possibility. Within the program, farmers are also unsure which opportunities will exist for other PPB farmers to access their finished material and vice-versa. The program would benefit from having farmers on the same page about this so they are not working at cross purposes and are not surprised when issues of registration and ownership arise.

A contradiction may arise if registration is a goal for UMPPB participants, and registration by necessity reduces the ability for seed to be exchanged freely. If the genetic rights arising from registration are enforced at the discretion of the license holders, PPB germplasm could remain freely available. In contrast, if the registration system is designed to extract royalties regardless of the interests of the license holder, this would be a severe impediment to free exchange. The question is, then, if registration is naturally at odds with PPB goals of democratizing seed.

“It will always be open source, in that there won't be any fees, extra fees or monopolies on the seed production or use. And so, as a farmer, I would be free to sell or share this grain with any other farmer anywhere in the world. And I mean, for people like me that's important.”

-Farmer 1

Conclusion

This study organized information from interviews with UMPPB participants relating to PPB commercialization and value chain creation. It explored the status of PPB commercialization, participant expectations and approaches to commercialization, and some of the barriers participants encounter. Through farmers' personal experiences and the more general themes synthesized from the collected interviews, this report offers perspectives that should inform further commercialization.

The UMPPB and BFICSS PPB program is clearly at a point at which it is being asked to demonstrate how it will be operationalized. Farmers have already taken steps towards demonstrating PPB's commercial viability, and we can look forward to more exploratory steps in this regard. These exploratory steps and the assessment of their successes and failures will offer essential lessons for continued efforts. It may be difficult to mitigate risk completely for the farmers on the forefront, so understanding and supporting their position will be even more important in this phase.

The way PPB crops enter the market will be a determining factor in the way its goals are manifested. PPB certainly holds potential for addressing some shortcomings of the conventional seed system. For many farmers it holds political promise in the fight to keep food systems democratic and responsive to the people growing and eating food. The act of farmers participating in the PPB program and exploring alternatives to highly centralized and privatized germplasm already makes it a success. Conscientious commercialization holds the possibility of giving this success staying power and implanting a radical approach to germplasm production in the public mind.

Deliverable 3: Detailed Farmer Profiles

Contents

Deliverable 3: Detailed Farmer Profiles	120
Farmer 4.....	122
Farmer 2.....	125
Farmer 7.....	128
Farmer 6.....	132
Farmer 9.....	136
Farmer 8.....	139
Farmer 10.....	142
Farmer 3.....	146
Farmer 1.....	150
Farmer 5.....	154

PPB Value Chain Discovery Case Study – Farmer 4

Participant Overview:

#4 farms 4400 organic acres, producing upwards of 800 tons of grain per year – which includes wheat (HRSW, occasionally spelt), oats, flax, hemp, and alfalfa seed. He is a bulk supplier to bulk buyers but has a relatively close connection to some mills. #4 was an early adapter of organic methods and has been sought out for his experience. #4 is associated with a variety of organic farming organizations and participates in multiple ventures related to regenerative agriculture.

PPB Context:

#4 participated in the first and second round of PPB selections and now has four PPB populations in Michelle Carkner's PPB trails which are being hosted on his farm. Michelle's study tests with check varieties and up to 30 populations from the PPB program. He has 4000 pounds of a population from the first round of selections, which would be enough to plant about 30 acres, though he is waiting on the results from the trials before bulking up to that scale. He has also sent some of his population for testing at a mill in Quebec. It performed quite well but the results are not definitive, especially in lieu of long-term testing. He acknowledges that UMPPB has performed well in agronomic testing.

#4 requires a population that performs well on his farm and meets the quality standards of the larger-scale system that he sells into. Ideally this population would yield 10% better than the best commercial varieties available to him, and this would make the prospect of saving his own seed much more appealing as well. Due to issues of low soil phosphorus on the farm, a population that thrives in low and high phosphorus conditions would also be ideal.

CURRENT MARKETS AND PPB COMMERCIALIZATION PROSPECTS

Current Markets and Value Chains:

#4 sells in relatively large quantities in loads varying from 20 tons to 300 tons, a significant amount of which is transported by rail. (A rail car holds 90 tons). He deals primarily with grain brokers who, in some cases, sell directly to end-users (ex: bakeries) and in other cases sell to medium sized mills. It is not common, but there are opportunities for #4 to sell directly to medium sized flour mills. He cites a good market for higher-quality high-protein spring wheat and notes that some of his buyers work with Red Fife as well - suggesting pathways for identity preserved wheat and wheat with specific quality characteristics. He also notes that most mills mill everything that fits in the Hard Red Spring Wheat class. He has sent a PPB population for testing to a mill in Quebec. It tested well for protein and baking quality, but no active interest was expressed by the mill.

PPB Commercialization Status and Intentions:

Like other larger-scale producers, #4 cannot properly assess commercial prospects until he produces enough of a population to test and sell. At this point, most of his considerations of marketability and

commercialization are speculative. Nonetheless, if it meets agronomic and quality requirements, he believes there are markets to be found and developed.

His consideration of PPB value chain prospects occupies different scales and market orientations. One outcome of high performance in testing could be entrance into the formal registration process as an organic variety. At a large/medium scale there is more pressure from the value chain for cultivars to be registered, but there are possibilities for unregistered varieties. #4 is particularly interested in the trial data being collected that will play a major role in determining agronomic feasibility and suitable directions for commercialization. With a promising population, he believes the conversation about PPB could be relatively easy to have with purchasers and millers, and he anticipates a range of interest and opportunities in both registered and unregistered populations.

The farm is a large enough operation that more intimate market arrangements such as a closed loop arrangement or identity preservation of a 'brand' are not immediately appealing. They may not be worth the time and effort - but they are also not off the table. The closed loop system (that is selling directly to a customer/processor outside of the wheat regulatory regime) would accommodate an unregistered population, and #4 believes it would be practical barring any unforeseen regulatory impediments. He notes that the market and opportunities for branded wheat that leverages a story or ethical feature is expanding/diversifying, yet it remains a very small percentage which would appeal mostly to smaller partners. As with most PPB participants, his interest in selling a PPB population as certified seed is extremely limited.

Barriers to PPB Commercialization:

Some barriers to PPB commercialization are related to the progress of the PPB program in general and some extend to the agricultural policy/regulatory/market landscape. #4 can't assess markets until he has something to offer. The progress of the program in general, therefore, is what will bring him closer to commercialization.

A broader PPB barrier implicit to #4's situation is that non-organic seed is easily accessible, and often quite productive, making it an attractive choice over organic seed. This is due partially to easily accessible organic seed derogations for organic farmers. #4 notes that "we save our own seed in some cases, but it makes more economic sense to plant pedigreed seed rather than selling higher value organic seeds." As long as non-organic seed is more productive and economical, and as long as it is easily accessible, it will be harder for PPB cultivars to enter the market.

One minor note with possible broad significance, is that #4 is not sure what the opportunities are for other farmers to access his material and vice-versa. Participants should understand this clearly as it will effect their commercialization choices.

Suggestions and possible approaches:

The way PPB will be commercialized is related to producers' expectations about how populations are used. You will market differently if you envision a static population that you arrive at and continue to

market, brand, and use in perpetuity. The likely reality is, though, that populations/varieties will vary in efficacy over time, and new populations will have to be sought semi-regularly. This will require “An ongoing process of breeding, selection, evaluation, and adoption... [that] should probably never stop.” This process is far more likely to suit a farmer producing for yield and basic quality specs than a farmer who wishes to brand their population, preserve identity, and maintain specific end-use quality traits.

Iain identifies collaboration with other PPB participants and the expansion of participants as a step in the right direction, and an opportunity to work together sharing and comparing varieties and expanding the total amount of genetic material moving through the program. This would facilitate the ongoing process of breeding, expedite the selection process, and increase the chances of arriving at a commercially viable population.

Quotes:

“There'll be some maybe smaller partners who might be interested in - if we can prove that we've got something that's of value - they would probably be interested in a particular variety or some branding opportunities or the marketability of a farmer selected variety.”

“If we can produce a variety that's better than what we can buy commercially, then yes, it would make sense for us to save our own seed.”

“There probably is the opportunity to have a closed loop system where we ship directly to a mill, and they mill it and sell the flour. That would be one opportunity.”

PPB Value Chain Discovery Case Study – Farmer 2

Participant Overview:

#2 is retired now, but his main work on the farm (before passing it to the next generation) was operating the on-farm mill '_____ ' which processed organic flour from their vertically integrated farm _____. The farm produces 1600 acres of field-crops - mainly wheat, but also oats (for oatmeal) and other organic products processed on-site. It is an organic operation employing a variety of regenerative practices centering around soil conservation. Wheat constitutes 35% of their farm acreage but they purchase wheat from other farms to meet the demands of the mill. The mill processes approximately 1000 tons of wheat per year, and their scale means a mill run requires approximately four days of eight hours of work.

The mill supplies several 'larger' bakeries as well as a number of small-scale artisanal bakeries with an interest in seed-provenance and connecting with farmers. Their standard bag of flour is 20 kg, but many bakeries will take full pallettes of flour - 40 bags of 20 kg. They also sell off the farm from a small store where customers have the option to order online and pick up through 'interactionless' sales. Much of their retail and wholesale marketing to various regional shops is done through Co-op AgroBio, a Quebec-based organic farmers marketing/distribution cooperative that #2 was part of establishing. The farm's underlying philosophy of self-sufficiency and resilient local provisioning led #2 to participate in a variety of organic seed research initiatives through the co-op and also informed his participation in the PPB program.

PPB Context:

#2 was selecting for a wheat that he could use in his mill. He selected for four years and spent two years increasing volume. He started with four crosses and narrowed it down to one that he preferred agronomically, prioritizing stability so that he could reproduce it dependably for milling. He thinks the program was a great match and he still has the seeds for his population which he may re-seed to keep it safe.

Commercialization was not the driving force behind his participation. He was mainly motivated by the pursuit of self-sufficiency in selection and breeding, seed ownership, de-coupling dependence on industry, and adaptability - especially in response to climate change. For him it was an experiment and an assertion of farmers' ability to do this kind of work.

CURRENT MARKETS AND PPB COMMERCIALIZATION PROSPECTS

Current Markets and Value Chains:

Besides a primarily Quebecois market the farm also exports to the US (Vermont) where they have made good relationships and found support/interest for their project. He notes that "the market development for the artisanal roller mill operation is based on close relationships with bakers and chefs dedicated to organic and local food production." These bakeries do not see wheat as a "common product", but as a special one that makes their bread unique. This perspective informs their interest in food sovereignty, connecting with farmers, and adding "specificity" to their product.

PPB Commercialization Status and Intentions:

#2's intention had been to send his PPB line into his own mill and market that as a unique product. He did not intend to capitalize on the seed development aspect of PPB (royalties, Plant Breeders Rights) and would be happy for the results of his participation to be available to others. He acknowledges that his situation is different than some other participants and this makes making money on seed development less of a priority. First, he only intended to capitalize on the end product of the seed. Second, seed production is not part of his business model, and third, being of retirement age, he may not have had to seek this as a revenue source as some younger 'establishing' farmers may be compelled to do.

He anticipated his PPB commercialization benefitting from his strong 'values-aligned' value chain partnerships. His value chain partners would have the ability/interest to transmit the story of #2's PPB project to the consumer, thus creating a niche product with a higher price-point or strong branding. #2 also thought value could be added through collaboration and the extension of his PPB participation to other members of the value chain. Before #2's PPB participation paused, he had produced enough of his PPB wheat to grind it in a stone mill and test it in focus groups with bakers in Montreal who were "very happy" with the results. Still, he would have needed to make more tests with his roller mill white flour to properly assess his line's commercial viability.

Barriers to PPB Commercialization:

An overarching concern is the perceived gamble [not his words] of time and energy on a PPB line that may not have adequate end-use quality. Not only are years of selection required before arriving at a suitable line, but it also takes a large quantity of wheat to be able to test it for quality through a roller mill and that quantity increase takes time. It also takes time and sometimes money to carry out quality testing. It may perform well agronomically, but there is no guarantee it will meet quality requirements.

A related issue is that most bakers, especially larger bakeries, require stable and dependable quality characteristics that may be difficult to achieve through a still somewhat heterogeneous PPB line. Varying quality characteristics can make it difficult to transmit a repeatable process to employees, for example, which can jeopardize entire large production runs. This barrier will be addressed in the following section.

One final challenge which will be addressed in the following section is the inability to access crop insurance in Quebec if a farmer's seeds are not on a restrictive list of registered varieties.

Suggestions and possible approaches:

#2 has developed strategies for addressing the two previously mentioned commercialization challenges. In the case of variety requirements for crop insurance, #2 accesses exemptions that are available to those whose seed heritage is central to their project, and who use seed that they are unable to access commercially. His approach to dealing with unstable/variable end-use quality is to reserve half of each year's crop to mix with the next year's crop. This staggered mixing ensures some quality continuity from year to year. He also notes that some smaller bakers, or "magician of baking", are capable of managing variability by manipulating wheat components or altering their recipes.

Relating to the gamble of bulking up a population and inability to test for quality at small scales, #2 has considered possible procedures for managing this so that processors can have input earlier in population development. It involves an iterative and participatory approach to testing with processors. Preferred bakers (processors) would be contacted in the earlier stages and asked to make tests, experiment with the population, and confer amongst themselves about their findings. This would also be a stage in which the process and importance of the project could be communicated. (Which would be a preparatory step towards developing market receptivity.)

As an advocate for food sovereignty and self-sufficiency, #2 believes that these concepts could be capitalized on in the promotion of PPB - especially in the face of supply chain vulnerability and climate change. Society is primed for the idea of seed resilience through experiences like COVID 19, the blockage of the Suez Canal, and strikes at the Port of Montreal that have impacted food transportation and displayed the vulnerability of globalized supply chains. Leveraging this social atmosphere could help to popularize PPB - further interesting and politicizing consumers/processors and conveying its importance.

PPB Value Chain Discovery Case Study – Farmer 7

Participant Overview:

#7 has been a consultant to farmers in her area for around thirty years, and has helped her clients with their PPB selections. She works on their agronomic issues as well as the performance and development of their business. On her own farm, #7 produces beef cows, oats, and maple syrup. Her cows are managed as a 'calf-cow' operation or "calves under the mother" in the English translation. She sells the calves to feed lots under the "producer plus" sustainability certification. She produces oats for hay mainly, but also sometimes to feed to the calves. Her maple sugar operation (including the sugar bush and bulk syrup processing) is certified organic. Her daughter will take over the farm in the next couple of years. #7's experiences observing the resilience and adaptation of landrace buckwheat in her area informs her motivation to participate in the PPB program.

Her participation is strongly informed by her desire for her clients to have better varieties. She describes her PPB clients as curious people with an interest in a progressive agriculture that is at the same time a bit more "back to basics". Often these clients are already trading, selling, and sharing organic seed with other producers or amongst themselves. They have a desire for local provisioning as well as connecting with and feeding the local population and they seek to do this by developing and marketing their own products.

#7's clients are often small producers averaging around 250-500 acres, and are working on more direct market, farm-processing, value added, off-farm sales. For example, one client is interested in heritage wheat and reproduces seed on their land from small batches and wants to make bread with it on a small-scale. Other clients include a grain producer looking to make a small brewery, a quinoa producer hoping to make and sell quinoa products on-farm, and one who intends to direct market heirloom soup peas. Most of them do not subsidize on this activity and have other sources of income such as dairy operations (on-farm) or other off-farm work.

PPB Context:

#7 has been selecting for oats mainly, as well as a small amount of wheat, for around ten years. She chose oats because they are characteristic of her region, and tend to express themselves well agronomically. She works with three or four oat lines at a time and is in year three of her current cycle, selecting in organic conditions at one of her client's farms. Her priorities are to avoid lodging especially in areas of high weed pressure in the fall, so she selects for heads that remain standing despite the rain and weeds.

#7's participants have discussed with her the poor performance of non-organic varieties and need for populations adapted to their environment, agronomic conditions, and farming practices. Additionally, her participants expressed a lack of knowledge of how to respond to this gap. This is why she saw PPB as an "opportunity to be seized" - it would allow her to work with her clients to address this gap and work with varieties that she finds more interesting. This makes #7 enthusiastic about the potential for PPB to enhance the resilience of local production systems, building knowledge and capacity.

CURRENT MARKETS AND PPB COMMERCIALIZATION PROSPECTS

Current Markets and Value Chains:

For #7's farm, the only value chain related to UMPPB is actually internal to her farm, because she uses oats to feed her calves.

The main markets and value chains of #7's clients that are relevant to PPB are the current sharing/selling of organic or heritage seed that is happening within communities of seed savers and small farmers. She has one client in particular who was interested in working with smaller quantities of heritage seed who invested in some older plot-sized harvesting equipment, but #7 notes that the number of people who can take this on, both economically and technically, is limited.

#7 has clients who work with oats, but she does not yet have a client who has tried to make an oat product (ex: oat flour). There is a consumer market for participatory crops based on the growing interest in local and sustainable food (partially driven by the pandemic) and the thriving local food culture in Quebec. #7 participants are working towards meeting this demand, and themselves aspire to feed locally and create resilient/dynamic local food systems.

PPB Commercialization Status and Intentions:

#7 says she would like to commercialize, but it is currently uncertain how this relates to her production of oats for cattle feed. If she is growing PPB oats to use solely as feed, the functionality of PPB for her would simply be to improve oat production on her farm and there would be no regulatory barriers to her doing so. She believes it would be necessary to make value chain partner links to market her PPB population, and would plan to make these links. She sees a desire among consumers for products like PPB, and thinks that it would be marketable - that is why she continues to work on PPB.

#7 did not describe her client's intentions for the commercialization of their PPB outputs.

Barriers to PPB Commercialization:

#7 primarily feels that PPB production is not meeting demand and that the production side of PPB will have to step up if it is to make itself known and fill the demand for local, innovative, 'regenerative' food. She notes that "If the production isn't there, we can't offer the product to the consumer even if he asks for it. He's already asking for it." (Note that "he's already asking for it" does not necessarily refer to PPB specifically but more to the general interest in local food undertakings.) A major component of this bottleneck is lack of access to the proper machinery and tools at the proper scale, especially the scale in between hand-work and work for a large machine. In many cases this is older equipment that is hard to acquire and maintain. It is also a risk for farmers to commit to such a scale change, especially as an individual endeavour, and this risk will be addressed in the coming section.

#7 identifies that PPB is unknown to both producers and consumers in Quebec, but for her, the main barrier is the lack of producer awareness and participation. Dynamics between producers make many producers hesitant to advertise their participation in alternative practices, especially when it is a new concept. Farmers are not necessarily embarrassed about their PPB participation specifically, but they are influenced and "afraid of the opinions" of their neighbours and therefore not likely to "shout it from the

rooftops". This is why farmers are not exposed to PPB, even if it is happening near them. #7 notes that there is a curiosity about alternatives, but that producers don't often talk about it. Augmenting this barrier is the lack of broader public explanations of the reasons for participating, as well as education about the needs that are met through a PPB program. She does not attribute this to a language barrier, with UMPPB participants communicating mainly in English.

A final barrier is that if a Quebecois producer wants to apply for funding programs, federal programs, and provincial programs they must purchase tested seed from a recognized seed company. PPB lines would not meet this criterion unless of course they went all the way through registration.

Suggestions and possible approaches:

#7's suggestions for PPB commercialization center on normalizing and popularizing to explain it and make it accessible to farmers. More farmers participating creates a kind of momentum when they see their neighbours adopting this approach because they are influenced by each other. The added utility of getting more producers on board and discussing PPB is that "producers, at some point, find solutions when they talk to each other" and could therefore strengthen the program. She sees a desire for alternatives, and believes if they knew about this programme and understood it, they would participate. She notes specifically that PPB would meet the alternative aspirations of the younger generation of farmers as well.

A communications strategy focusing on social media would be useful, as farmers need to know about PPB if they are to adopt it, and consumers need to understand it if they are to see the value in it and choose PPB. A communications strategy would build familiarity with the concepts of PPB, as well as getting producers to ask questions and eventually participate. #7 believes social media is a good approach for this kind of strategy because it is a popular tool for Quebecois farmers and also because it appeals to young people.

On the far end of this process - once participants have a PPB product to offer - #7 envisions needing some marketing support for producers. She notes that there is technical support in the program for production and selection, but not in marketing, and that many farmers lack confidence or knowledge in this field - especially when it comes to novel/niche products. This could come in the form of marketing specialists to consult with the program or participants. #7 personally feels this need and does not possess the level of skills for this work.

When asked about the viability of marketing coops in PPB, she acknowledged that it would not appeal to larger cooperatives but that organic producers would be more open to this idea.

#7 thought some kind of field-day would incentivize people to look into PPB, and had some ideas about how it might look. She would be sent some selections to create a setup of small plots which could then be presented to local producers by Bauta staff - demonstrating its efficacy, answering questions, having valuable exchanges with farmers, and explaining the nature of the program. #7 thinks the producers would encourage each-other and go home to think about it. (Note, BFICSS has initiated some field days, though the exact nature of them, and how many were for PPB I am not aware.)

Her approach to overcoming the barrier of machinery scale in production is to organize amongst producers to share equipment and help each other, thereby giving the value chain "the means to

organize itself". #7 believes it would be effective to share or rent medium scale or plot-sized farming and processing equipment between PPB producers which could make the rounds of the participants. Harvesting and processing at this different scale would expand their processing capabilities, allowing for the diversification of income for participants without having to take on the full risk and investment in a scale transition. Through this means, they could start small by dedicating only a portion of their land and time to this endeavour, and #7 would participate in this kind of arrangement.

#7 sees this sharing approach as a part of popularizing the idea of PPB for producers and eaters and working towards strengthening the program with more farmers. One example of this would be the potential for these shared processes to facilitate some kind of farm tourism opportunity, so both producers and consumers can see the process at work. If other farmers could see the viability of PPB work at this scale, it may seem doable for them and they would be encouraged to participate. It would also appeal to consumers, creating sales opportunities, opportunities to add value to production, and move PPB into the popular understanding. The exact structure of this has not been elaborated.

Quote

"Yes, I would like to have links. Yes... And I think it would be necessary that they be there, those links. [value chain links]"

PPB Value Chain Discovery Case Study – Farmer 6

Participant Overview:

Farmer 6's farm is a 94 acre certified organic farm (typically cultivating approximately 25 acres of the total acreage for grain) primarily producing grains for the Fraser Valley. Most of their product is sold as kernels but they do some light processing on the farm and contract most of their milling to a mill in Chilliwack. Their main market and driving force of the operation is their grain CSA supplying between 150 and 200 members in the Vancouver area. They also sell to a number of bakeries, sell wholesale to retailers in a number of local communities, a number of Vancouver farmers markets, and they do a limited amount of custom orders. The farm has benefitted from a strong demand for local organic grains related to the local food movement (100 mile diet) and the rise of CSA marketing.

#6 and partner have sustained off-farm employment during their stewardship of the farm, pursuing it more as a socially and ecologically integrated endeavour in a model that they intend to become self-sustaining for the next stewards. They maintain a variety of ecological certifications and regenerative practices and pursue connections with value chain partners and contractors who are "similarly inclined". The farm is well publicized and carries a good web presence, including a blog for their CSA members from time to time. The farm serves as a model of possible alternative agricultures and a mechanism for education leading to social and ecological betterment. #6 has been experimenting with wheat varieties amenable to organic production in the Fraser Valley for several years.

PPB Context:

#6 is bulking up selections of a wheat line coming from Red Fife crossed with a modern variety and early indications/testing suggest good agronomic performance and end-use quality. #6's cross underwent a year of high environmental stress in 2020 including rain, wind, and high weed pressure and it performed well (if not better) compared to some of his well-used varieties. Baking quality has been assessed by one of his bread makers and a baking teacher from a Vancouver college who have assured him that his cross is "of an attractive quality from a breadmaking standpoint". These experiences give #6 the confidence to continue increasing his line which had three acres planted in 2021 and would potentially enter his CSA. Despite this initial promise, the jury is still out on his PPB cross and #6 continues to approach the process with rigour and objectivity.

#6's objectives in participation were to supplant his current Hard Red Spring Wheat varieties (Marquis, CDC GO) with a more favourable one both for end use quality and agronomics. He sought to enjoy the benefits of modern plant breeding while still maintaining the Marquis' flavour that is desired by customers and retaining the marketing 'hook' that comes from the story of genetic heritage. Agronomically, he needed a rust-resistant wheat that could tolerate high weed pressure and the precipitation/moisture/climatic challenges of the Fraser Valley. He was also attracted to PPB for social reasons - namely the opportunity to educate on public policy and research, and the benefits of a cooperative process.

CURRENT MARKETS AND PPB COMMERCIALIZATION PROSPECTS

Current Markets and Value Chains:

The majority of #6's sales are of whole kernels of grain. The Farm has equipment for grain cleaning as well as a couple of small mills, a roller, and a crimper for their minimal on-farm processing. The bags of flour they mill on-farm are small - 750 grammes and 1.4 kg - and those are largely sold at farmers markets. A CSA grain/flour share comes in a box of 20kg divided into 5lb bags. This is typically milled and bagged by Anita's Organic Mill in Chilliwack who will do runs equivalent to one or two large grain tote bags. Typical runs would be 1 to 1.5 tonnes of hard red spring wheat or 1.5 to 2 tonnes of soft white spring wheat. Their custom orders are smaller - 5 kg bags, occasionally 20 kg, and some people refill plastic pails.

Most of #6's value chain partners operate at a level at which they can preserve the identity/history of grain. They have an interest in the story or branding potential of their grain and often the provenance of the grain is deliberately linked to the farm. Once again, demand outpaces supply. One major bakery client is Bad Dog Bread in Vancouver which is "very much tied in with the ideological framework" that #6 espouses. They receive approximately monthly grain deliveries from #6 and they self-mill. A previous value chain partner of note is A Bread Affair, also in Vancouver, who were a stimulator of the farm's initial forays into growing Marquis wheat. They successfully brand and leverage the history of Marquis; highlighting it on their website and drawing attention to the farmer. Another unique customer in retail is a store that sells bulk products in a 'bring your own container' style. #6 identifies them as having aligned values and they have requested information on #6's varieties to communicate to customers.

PPB Commercialization Status and Intentions:

Though the success of #6's "Manitoba Cross" (his PPB line) is not yet a "slam dunk", it is still promising enough to be a continued interest and he will continue growing it. #6 believes you only find out how a line will work through growing it year by year, but it if outperforms his other varieties, namely Marquis, it will likely supplant them. He has no intention or interest in registering his line.

The most promising commercialization prospect is entry into his CSA, and whether or not this will happen depends on if he had a strong growing season and harvest. #6 believes three acres of the Manitoba Cross would be enough to supply both his CSA and a good part of his farmers market customers. If he does sell it to his CSA, #6 would tie in some kind of educational element about PPB and believes his members would be fascinated by it.

#6's PPB cross has been tested by Vadim at Bad Dog Bread, as well as two of his CSA members - one of whom is a baking instructor - and they were "quite taken with it." These reviews give #6 confidence that it should be attractive to, and useable by CSA members. They may have to make some tweaks in their techniques and recipes, but he will be able to offer it to them "in good conscience".

#6 discussed the hypothetical of selling to other producers, but it was clear that he would have to be very confident with its performance and end-use quality, and did not elaborate much on this topic. If he were giving it for free to other producers, it would be with the stipulation that they trial it first.

Barriers to PPB Commercialization:

The barriers to #6's PPB commercialization mainly relate to testing and the complications of educating about and marketing PPB. #6 is wary about sending this population to his CSA members, bakers, and long-time customers without having it more thoroughly or officially tested. The problem is that he is unsure of the options for testing - how and where. He mentioned the Canadian Grain Commission but is not sure they would be very interested or amenable to his population. #6 describes testing as "a whole process" that requires brain power, time, and energy - and he already spends a lot of those on his other tasks.

The second barrier relates to how people come to understand and develop an interest in PPB, mostly in the lack of a clear story or concise description of the project and product. #6 said, "There's a story there. It's a very interesting story and it's a very compelling story, but it's complicated and it takes time to describe." There is nowhere he can point people as a concise source of information. Developing these resources and spending the time to educate people about PPB - what it is and why it's different - is fun and interesting, but time consuming. #6 outlines a solution to this in the following section.

Suggestions and possible approaches:

#6's ideas around commercialization circle around branding and marketing - acknowledging that "it's only the marketing that's going to make people interested," especially when justifying the purchase of a more expensive product. It must be noted that #6 recognizes the pitfalls of modern advertising and is hardly mercenary about this, but in a benign sense he sees communication of PPB's purpose and uniqueness as essential.

Broad ideas around branding include the need for a name, an image (possibly a logo), and a catchy phrase - as "Participatory Plant Breeding doesn't exactly roll off the tongue". This work would develop something "instantly recognizable" (similar to organic or salmon safe labelling) and in #6's mind it would distill the collective wisdom of the group into a name.

He thought ideas could be taken from his experience marketing and communicating about Marquis wheat and the development of something easily packageable. Marquis was very effectively publicized by Radio Canada through an educative show, and information about this variety could be found on a website. #6 was able to send links for people to easily learn more about Marquis and he also didn't need to come up with this communication himself.

As for concrete ideas, #6 had one store (the bulk 'bring your own container' store) that expressed interest in some sort of brochure about his hull-less oats that communicated what they were and why they were different. They clearly saw this as an important educative and value-adding step. He also reflected on his experience with Salmon Safe certification and their use of tangible marketing through stickers and a banner for putting behind a farmers market stand.

The collective nature of the program is important to #6 and would add value for consumers. #6 sees potential in the idea of an online interactive map for popularizing PPB, but also for its ability to communicate the fact that farmers participation is actually "part of something bigger" - part of a collective, and a movement. He notes that all of this work takes time and expertise which could benefit

from the horsepower and knowledge of professionals. He supposed there would be people willing and interested enough in this issue to contribute their efforts out of the goodness of their hearts.

Quotes:

“Bread Affair, he was basically saying, whatever Marquis you can grow, I will buy at a very good price. So why are you bothering doing this CSA stuff? He didn't say that, he's too polite for that, but that was, in essence, what he was saying.”

PPB Value Chain Discovery Case Study – Farmer 9

Participant Overview:

#9 produces livestock and a variety of grains, including wheat, in his crop rotation. The farm became completely certified organic (crops and livestock) in 2011 but has been working towards organic production since 2000. They work with a “regenerative organic farming” model, employing a variety of techniques including the use of multi-species cover crops, perennial hay mixes, and integrated livestock. Their livestock is fed completely from their own farm and meets a variety of ecological and quality standards/certifications.

PPB Context:

#9 is in the process of bulking up a wheat variety, having arrived at 3 viable populations and now focusing on scaling up one. In the 2020 season he produced two bushels of this PPB population and the 2021 season he anticipated planting one acre. #9 hopes the focus on one population will yield more seed to work with, as so far they have only yielded enough to bake a couple loaves of bread for their own consumption. (No complaints about the bread!) He believes he is three or four years away from reaching marketable/testable quantities of PPB wheat, but for now it seems to be performing well agronomically and in some tests has displayed higher levels of certain minerals than check varieties. #9 has sent his population to a friend’s research farm for further agronomic testing and has not yet received those results.

#9 started with the PPB program working on wheat in 2012 and had selected for oats at one point, but that work has subsided. His intentions with the program are to produce populations that perform well agronomically in the particular stresses of his environment and have good milling quality. He is working with crosses that came from more “established” bread wheat lines (from the first UMPPB cycle) and therefore has a good degree of confidence in their potential agronomic and milling quality performance. He encountered major challenges last year with weeds which may have slowed progress, and he continues to encounter time and opportunity cost challenges, including a previously noted discrepancy between combine/machinery size and test plot size.

CURRENT MARKETS AND PPB COMMERCIALIZATION PROSPECTS

Current Markets and Value Chains:

The grain operation primarily supplies local/regional mills in Manitoba but does have customers in other parts of Canada. Though local, these mills are large enough that identity preservation is difficult or unlikely. All of their grain is marketed off the farm in semi-load lots. They maintain an active internet presence through their website (which included a blog until 2020), Facebook, Instagram, and several local/sustainable sourcing sites. These avenues are relevant for marketing, branding, and sales.

PPB Commercialization Status and Intentions:

The practicalities of marketing or registration are a long way off, and depend on arriving at a superior population as well as producing sufficient volume. Sufficient volume of seed is needed both for testing (agronomic as well as quality) and for customer demonstrations. A baseline consideration for #9 is that mills will have to want his PPB wheat - and they will want it cheap. It must meet or exceed quality standards and he must be able to sell it at a competitive price. So far there has been no expression of interest in his population despite promising early testing.

If he can arrive at an agronomically superior population with adequate end-use quality, #9 considers two main commercialization paths. First would be to market it, either registered or unregistered, selling to the local mills at which Farmer 9 currently markets, or possibly to smaller mills capable of entering niche markets. #9 was of mixed mind speculating on the registration requirements in his markets, stating that "it won't enter any of those [local mill] streams until it's a registered variety - I don't think anyway." This leads to the second option of registration, in which his variety would have to be appealing enough to other producers (both conventional and organic) for them to adopt and plant it. Registration would also give his population more potential for selling into the milling market. In both contexts the population would need to be competitively priced as it is less likely to leverage value from identity preservation.

Another option for adding value that #9 mentioned was having his PPB population custom milled. This could also accommodate unregistered varieties, but it is "a whole other can of worms to get into" and was not high on his list of considerations.

Barriers to PPB Commercialization:

#9 thinks bigger companies will likely not want to work with identity preserved varieties because of the logistical headaches of managing and separating small quantities of grain within large capacity systems. #9 also indicated that mills might have some reservations about PPB lines derived from heritage variety crosses which could curtail their interest in a PPB population. #9 is using more standard bread wheat crosses and so is not dealing with this problem, but he believes it could be an issue for other farmers.

The complexities of registration are a barrier to commercialization, and #9 has identified this barrier in two broad categories. First is the inherent difficulty of registration, especially if the farmer is to pursue this without much support and take it from start to finish. This takes even more time and money beyond population development. Second is the changing nature of support for farmers in this process, especially through the shifting/loss of partners, staff, advocates, key knowledge holders and institutional memory. #9 is not certain what resources exist for farmers wishing to pursue this, and notes that key people have left (ex: those embedded in Ag Canada) who would have had the knowledge to advance this process.

Regarding the functioning of the UMPPB program, there arise natural barriers to commercialization. Firstly, it is a long process to produce promising populations, and #9 can only begin to consider commercialization as quickly as the program can produce promising populations. Compounding the barrier of time is the uncertainty of the results of his population development. Despite #9's confidence in

his population's parent material, he still perceives it as something of a gamble, especially when end-use quality can only be tested after scaling up.

Suggestions and possible approaches:

#9 thinks that smaller mills and those capable of doing "one-off batches" will be the most likely to be interested in purchasing PPB populations – especially given that they will probably be unregistered at first. These mills would be the ones interested in the "Manitoba bred-and-grown" story, and their small scale and batch size would facilitate PPB identity preservation because it doesn't get homogenized in a much larger batch/run.

#9 sees identity preservation as the main alternative for adding value to PPB beyond basic quality and price, and it is also likely the most significant value-added element for any unregistered variety. Large processors/vendors are not significantly engaged in identity preservation. Their capacity for, and interest in identity preservation are inversely related to the scale of an operation.

Quotes:

"It'd have to be smaller mills, like I said, that are doing kind of one-off batches would be the ones who'd be most interested, like, you get into some of the bigger companies, well, they don't want to work with identity preserved varieties as much just because it's more of a headache for them to keep their equipment clean and stuff on a variety that at the start wouldn't be registered. So that's why I'm saying, yeah, any of the bigger players aren't going to be interested in it unless it's a registered variety."

"On the grain side, most of [ours] goes to local mills, I guess, for the most part, the wheat and the flax and the oats that we grow. So this would kind of fit, I mean, it'd be more of a niche market, the PPB, at the start for sure. It won't enter any of those streams [local mills] until it's a registered variety - I don't think anyway."

"The story is, well if it's a bred in Manitoba wheat, well then there's some smaller Manitoba mills that that would be a story they could use as well. So that could be helpful too."

PPB Value Chain Discovery Case Study – Farmer 8

Participant Overview:

The Farmer 8 farm sells potatoes under the _____ label, which is actually a partnership with two other farms, collectively farming 600 acres of organic potatoes. #8 also grows barley, corn for cattle, as well as peas and beans for the frozen market.

Certified organic since 1995, the Farmer 8 farm is involved in several other conservation activities and partnerships for regenerative agriculture, including a partnership with Delta Farmland and Wildlife Trust. They have their own on-farm organic research program that housed their PPB tests. They also market an off-grade potato brand called “Pugly-Potatos”, promoting it as part of the ‘ugly vegetable’ food waste reduction movement. They also run an organic brewery using their own organic grains.

PPB Context:

#8 started with UMPPB in 2013, producing two lines with good performance in variety trials from that first round of selections. His second round of selections starting around 2019 did not reach a point of selection where they were sent back for re-evaluation. His more ‘successful’ first gen. populations were being cloned and bulked by UMPPB partners for further BC trials, but with the onset of COVID and other complications they didn’t manage to organize with UMPPB to get it into the 2020 trials. #8 has expressed some doubt about his ability to make thorough selections, especially when selecting for specific tolerances (disease for example) when the selection pressure is not there. He thinks development might have to be longer-term and wider spread.

#8’s aim in the program would be, ideally, to produce a variety that could be registered, sold as food potatoes, and sold as late-generation certified seed. #8 was selecting for advantageous agronomic traits in organic conditions such as stress and disease tolerances that cannot be managed by conventional means such as chemical sprays. He was working with AAFC parent stock initially, including the Redsen variety with which he had previous experience, and hoped to breed out some of the “Achilles heels” of that variety which was otherwise quite good.

CURRENT MARKETS AND PPB COMMERCIALIZATION PROSPECTS

Current Markets and Value Chains:

#8’s current value chains that would relate to his PPB potato breeding are his role as a certified seed potato producer (not a breeder – he receives and propagates early generation organic potato seed) and a certified organic potato producer. Half of the farm’s potatoes go to US markets and the rest are sold domestically, directly from the farm, primarily to major chain stores, but also to some smaller local stores. They ship cross Canada by rail and locally in reefer trucks. They used to have an organic seed supplier who

stopped producing organic seed because of work, risk, and cost. Now they use primarily commercial potato varieties, not specifically organic.

Some of their customers preserve and promote the farm's identity, and they have an active online presence through website, facebook, Instagram, and twitter which they appear to use effectively for communicating to their customer base interested in their personality, and the story behind their food. They also utilize other online organic food sourcing consolidation websites. One really interesting marketing feature/product is their 'pugly potatoes' brand which markets 'off-grade' organic potatoes at a reduced price, leveraging the ugly-food and waste-reduction movements. They have experienced a good response to this strategy and it demonstrates their experience and participation in more politicized, ideal-driven, market-segmented spaces.

PPB Commercialization Status and Intentions:

#8 is somewhat stalled at the variety trials / testing (requires more testing) and is unsure how or if he wants to proceed with the registration process. Like most of the others, #8 will need to cross the threshold of producing a superior potato before he really considers the question of registration, markets, value chain creation and marketing.

#8 would not proceed without registering his population and had not considered options for growing and selling outside of regulations - implying this would be irresponsible. This is a major complicating factor in the breeding and marketing of PPB potatoes. If he could get a superior potato, he would likely want to have it grown and provided as certified seed for his own potato production. He would be able to commercially produce it as late generation seed, but would need a lab to do the early generation crosses.

If he could get through the registration process and start growing and selling an agronomically strong potato, he thinks the PPB component could be a selling point. This could be both if he managed to create a unique potato, and in leveraging the PPB story/identity.

Barriers to PPB Commercialization:

#8's barriers are mainly bottlenecks related to the registration process. PPB or not, the task of registering and developing a potato variety is complicated, costly, and risky – you cannot do it casually. The dollar outlay of registration is itself prohibitive – thousands of dollars - but then even after a variety is registered there are development costs. These relate to finding organizations that will clone the variety and then finding early generation seed producers that will continue to work with you to 'bulk up' and do the early generation propagation if you intend to sell later generation seed. There are not many of these organizations either.

The uncertainty is also prohibitive, especially for a smaller producer moving a single variety through trials, registration, and marketing. #8's PPB potato is the best of his selections, but there is no indication it is the best for his programme or a truly competitive/desirable potato – especially when competing with organizations that are trialing thousands of lines. Even if a superior potato was achieved, the work of

attracting buyers is tenuous. You need to know that someone will buy it, and even if someone decides they like it, it takes years to breed up to the scale of marketing commercially – a significant time lag. The market fluctuates with tastes, so there is also an element of speculation and resources that must be invested in a multi-year process that could prove fruitless.

If, after these trials, a potato is registered and increased to quantities that are ready to be sold as seed/potato, farmers will have to deal with a tiny organic potato and potato seed market. Much of this demand issue is related to the ease and ubiquity of derogations, allowing farmers to use non-organic seed if there are no organic options for the variety they wish to grow.

Suggestions and possible approaches:

#8 spent some time talking about the need for clarification in the overall PPB process, especially after the selection stage. He would have liked to know better what his options were for his PPB material and what is involved in the process of registering and commercializing a PPB potato – a more laid out path from selection to commercial viability. He acknowledges the existence of a learning curve both for farmers and PPB program administrators, but believes an examination of this process will be important.

One of his ideas for crossing the ‘post-selection / registration’ barrier is the development of a mechanism where a desirable PPB selection would be handed off to an organization for the more arduous tasks of registration and market development. The farmer would then be able to access that variety further along the process and/or gain some recognition for their work. This kind of support after the selection stage is important. A group like AAFC or the university would be able to “carry the ball” after selection.

Another one of #8’s suggestions would be the development of a system geared towards smaller production – either through a channel for registering varieties outside of the commercial stream, or a temporary crossover into the conventional market which would generate the large-scale commercial buy-in needed to see it through commercial development and eventual re-entry into the organic market. This would once again be the territory of larger more equipped organizations, and would likely require partnership with an early-stage cloning lab committed to working with this alternative stream.

A final thought that #8 had was that there are successful organic breeding programs internationally that would have some expertise in this field and likely some insight into small-scale breeding or developing the market for organic potato seed. This could be an area for further study.

PPB Value Chain Discovery Case Study – Farmer 10

Participant Overview:

#10's farm comprises 850 acres of total management approximately 30 km north of Edmonton, AB. They harvest three-to-four-hundred acres annually and much of the land is set aside for biodiversity and ecological restoration projects. Their primary farm enterprise is wheat and other organic grains (rye, oats, barley, flax, canola) but they also produce peas, fava beans, alfalfa, sweet clover, and a number of nutraceuticals. They also offer a custom grazing pasture. Until circa 2017 all of their grain production was trucked off farm by organic grain brokers as a wholesale commodity. Their direct market comes primarily from a half-section (320 acres) that changes each year in rotation, depending on what is under cultivation.

#10 began direct marketing organic grain in 2017 which represents 60% of their gross revenue as of Dec 31, 2022, and is still growing. They supply organic bakeries, an organic mill, an organic soy-sauce producer and a handful of organic/health-food retail outlets. They also offer individual off-farm and delivery sales which make up 75% of their direct market revenue as of December 2022. They do not have a website but do manage some marketing through social media.

PPB Context:

#10 worked with wheat crosses starting in 2012 and has arrived at a line that he is satisfied with. It is performing better than his conventional varieties, and is currently being testing with other farmer populations and performing well. It still requires longer term agronomic testing and #10 will soon have sufficient quantities for baking and taste trials with his baker as well as some limited lab analysis for falling number and protein content etc. He is two seasons away from having enough quantity to make it commercially available and, provided end-use qualities are satisfactory, it will likely supplant his standard Hard Red Spring Wheat for his direct market clientele. This has been communicated to and well-received by some of his value chain partners.

He hopes that the story behind his PPB line as a farmer-bred variety will add value for his clientele, and he also hopes that it will add resilience to his farm in a changing climate via the genetic diversity and plasticity of early generation germplasm. Philosophically he sees PPB as a response to industrial/corporate control or "corporate neo-feudalism" in the food system and values alternative ownership arrangements for germplasm. Agronomically, he requires a population that can produce a good head despite high weed competition and unpredictable/variable conditions. #10 intentionally exposed his line to these stresses during his three years of selection.

CURRENT MARKETS AND PPB COMMERCIALIZATION PROSPECTS

Current Markets and Value Chains:

#10 is continuing the transition to smaller-scale direct marketing if it remains lucrative, though he and his wife have no intention to mill/process his grain. In his direct market sphere, a big customer purchasing off-farm might purchase 500 to 1000 lbs of wheat in 50 lb bags every six months or so. One of his main processor clients is Bonjour Bakery in Edmonton, the bakery that started his move towards direct marketing. They had been looking for local grain specifically and for the grain to be delivered right to them (organic being just a bonus) and they pay a premium for #10's wheat. They mill fresh every week and #10 makes monthly deliveries of hard red spring wheat in a pickup truck. The baker likes to introduce #10 to his customers, clearly valuing that relationship, and #10 enjoys meeting them.

#10's customer who produces organic soy sauce (Amano Foods, Richmond BC) now purchases as much hard red spring wheat as the baker. They exist at an in-between scale which prevents them from being able to purchase wheat in bulk (ie tractor trailer size), and so #10 fills this need delivering one ton tote bags, or 2000 lbs, on pallets which he ships to lower mainland BC. Another not insignificant customer, purchasing half the volume of Bonjour and the Soy producer, is Strathcona Stone Ground millers. They are a small organic grain mill that has recently begun supplying Friesen Brothers stores with flour which is significant because, though locally owned, Friesen Brothers is a large retailer on the scale of Sobeys or IGA.

The farm's direct marketing benefits from its proximity to Edmonton, as well as mostly word of mouth marketing and some online tools like Facebook and Kijiji. #10 plans to develop a website to strengthen his direct market. Currently the farm uses an heritage de-registered variety of hard red spring wheat known as 'Park'. Using this variety, they benefit from a market edge, citing a book called "Wheat Belly" which positions older wheat varieties as more healthful for their lower gluten content. Park is the oldest variety #10 could find but will supplant it if his PPB population continues to perform well.

PPB Commercialization Status and Intentions:

#10 intends to switch out his current HRSW varieties with his PPB population but will continue to grow Park wheat and make the switch gradually until his PPB line is successfully integrated. He does not foresee any barriers in doing this because he is not working within the grain regulatory system. He does not foresee capitalizing on ownership of the population and has expressed a willingness to distribute his line to those who ask. He believes the interesting story behind the creation of his PPB line will be as attractive, if not more attractive than Park wheat to his consumers, and is "keeping his ear to the ground" for larger grocery chains/outlets that are taking interest in the 'local' market.

Further lab analysis on end-use and nutritional quality will be required, and this will be carried out with the support of his baker. #10 also intends to retrieve the information on his population's genetic history/parentage and work this into the marketing, forwarding genetic variability and climate change resilience as selling points. He believes this story will be attractive in the context of the local food movement and increasing social interest in short value chains. He sees a lot of passion coming from his customers who are eager to financially support an alternative to the conventional food system and believes PPB will also be attractive in this context. These factors make him confident that customers will be enthusiastic about PPB, including those who purchase and mill their own grain as well as those on-farm customers who have the experiential/educational benefit of visiting the farm. In this way, he

believes the identity and story of a PPB variety will likely stay intact until it reaches the end-point consumer.

As for his value chain, #10 thinks that as long as his PPB line is qualitatively within the status quo of HRSW, his customers will be open to its' use and will like that it was developed locally, that they can source it locally, and that it is outside of the commoditized wheat system. He has "buy in" from Strathcona Stone Ground to try his PPB line - to mill it and sell it - and as Strathcona is now carried in Friesen Brothers stores (retail grocery) #10's PPB wheat would therefore find 'mainstream' retail consumers while still bypassing the grain regulatory system.

Barriers to PPB Commercialization:

A barrier is #10's inability to select/test for quality earlier. Mid-selection quality testing may not be feasible, but the inability to do so is still a challenge and a gamble if one is to select, bulk, and then test a line for which they have no indication of the end-use quality. At this point, despite #10's confidence in the variety, he acknowledges that it will require long-term testing before it becomes commercially dependable.

He also encounters the perennial challenge of multiplying his population past the midscale as he lacks the time or equipment to handle this scale. He has considered a solution to this barrier which will be discussed subsequently. Another barrier for #10 is the burden of population curation and maintenance. This is not insurmountable, but it does represent a burden when normally one could simply purchase new seed each year and not worry about its storage.

#10 identifies the absence of "larger scale but [still] local milling" as a final barrier. The size of #10's value chains and end-use markets are limited to processor production capacity. An example of this is #10's milling partner Strathcona Stone Ground, who struggled to meet the demand from the Friesen Brothers grocery chain. They managed to produce enough flour to enter Friesen's market, but if they hadn't, this would have cut out an opportunity for #10's PPB to reach larger markets. The ability of partners/processors to meet volume requirements of larger markets therefore becomes a gatekeeper for PPB products. It is unclear if #10 has searched for this production capability in his area.

Suggestions and possible approaches:

As for the perennially difficult stage of crossing the middle stages of multiplication, #10 may employ a local private research organization called "Gateway Research Organization" to help him. They have the land base and plot-sized equipment to bridge the gap between small and large volume, and #10 notes there are similar organizations across the prairies. I am not certain where the role and capacity of the University of Manitoba overlaps with this, but if these private organizations were to participate in this portion of the PPB project, they would become a novel upstream value chain partner.

Provincial organic groups (Organic Alberta, Saskatchewan Organic Direct, Manitoba Organic Alliance) or other not-for profit organizations could also be helpful in offloading the personal burden of farmers in the late-stage development, varietal registration, and licensing of PPB populations. This could be beneficial to the organization as a revenue stream, unburden the farmers, and #10 said that even if there were royalties to be paid he would not mind supporting an organization like this.

#10 liked the idea of an interactive map as a deliverable of this project and saw commercial application for something of this nature, either as a marketing tool to reach consumers or as a tool for further connecting farmers and participants. Not only can individual consumers see, learn about, and eventually patronize PPB participants, but farmers can also find sources of PPB seed in their area. He noted that he would rather support other PPB farmers by using their varieties than go through the entire selection process himself. Media such as this map could then play on the cooperative aspect of the PPB program, allowing for greater intra-program seed trade between participants.

PPB Value Chain Discovery Case Study – Farmer 3

Participant Overview:

#3 is not currently farming commercially. He works for the Climate Agriculture Initiative BC and continues involvement in a variety of agricultural organizations and projects. He studied Land and Food Systems at the University of British Columbia. From 2013-2015 #3 was part of a mixed vegetable operation formed with peers from UBC who decided to go into small-scale farming together. Their vision of an alternative and smaller-scale food system led them to pursue direct markets such as farmers markets and community shared agriculture. #3 started the next farm in 2016 and operated it until 2018. It is no longer in business, but #3 still rents and farms the 2.5 acres that it occupied – mostly cover cropping. He manages around ¼ acre for dry beans, corn and squash breeding projects, and potatoes for home consumption.

Potatoes were a major crop for and they supplied a CSA in Courtenay as well as a variety of farmers markets. At the time of PPB participation, #3 was considering and initiating a change to slightly larger scale and market orientation and was thinking of pursuing a small-scale grain and milling company. He also considered scaling up the farm's potato production to provide potatoes to local grocery stores. He saw PPB fitting into their current model as well as their aspirational model because of its potential to respond directly to their 'alternative' needs. He saw value in the ability of PPB to help farmers breed crops that are challenging to breed independently, help them engage with research, and to cultivate breeding skills.

PPB Context:

#3 got involved with PPB in 2013, selecting from 100 mounds each of two different F1 potato crosses for three years. They arrived at 10 or 12 populations that they liked, all derived from one of the crosses, and these populations outyielded their commercial varieties. They also made some wheat selections which did not progress as far, but they did some work increasing other PPB wheat lines. #3 maintains his PPB potato lines in his personal garden for his own use and intends to continue doing so. Remarkably, he has not yet experienced viral load suppression of yield, but intends to carry out some vegetative reproduction of his lines to manage viral load. He also retains a few bags of PPB wheat.

The farm's collective interest in agricultural alternatives, research, continued education, and climate adaptation led to their PPB participation. They pursued agronomic performance, yield, aesthetic appeal, and cooking quality in their potato selections. They also carried out limited testing of their populations, mostly in their own kitchens – and to varied results. #3 was able to sell their PPB variety at farmers markets on several occasions. They received communication from AAFC re: varietal registration but the complications of the process and the lack of benefits in their context proved prohibitive and unappealing.

MARKETS AND PPB COMMERCIALIZATION PROSPECTS

Former PPB Commercialization Status and Intentions:

For the farm's potato populations, they had intended to develop something they could grow on the farm every year and possibly share with other farmers. They performed well agronomically, looked good, and tasted good, and #3 saw a lot of potential in three or four populations in particular. They had no intention or registering these populations, especially after being approached by AAFC and hearing about the process, so they would have simply continued to grow it themselves. They ended up with enough quantity and stability in these lines to direct market them a handful of times at the Courtenay farmers market where they met with interest and reports of good quality. They also encountered no regulatory barriers. #3 believes they could have expected to sell more if the farm hadn't closed.

#3 perceived good market potential based both on the visual appeal and interesting story behind their PPB potatoes. His experience is that customers are compelled by visuals, and he thought his potatoes were quite visually attractive. He also thought the interesting story behind the potatoes' development would be interesting to customers and that it would be even more interesting if they gave the population/variety a name. Based on agronomic performance and the story of being unique and bred for Vancouver Island, #3 thought the populations would also be appealing for use/production by other farmers he knows in the area.

Regarding marketing, #3 found it hard to figure out what to say about his populations. One challenge was an apparently a low baseline of popular understanding about variety development, though sometimes people were familiar with these issues and took an active interest. On the other side, #3 had experiences with multiple people asking, "Does that mean it's GMO?" and others "recoiled". He believes he might have given more information than was practical at some points and settled on a version of the idea that "it's a partnership with the university to breed for organic." This seemed to work - people thought it was cool and most were curious enough to try it.

Barriers to PPB Commercialization:

The barriers that #3 sees with PPB wheat as opposed to potato commercialization are about the selection process as well as their perception in the market. Firstly, #3 perceives wheat to be a more difficult selection process, lacking certainty because it takes more time to taste, see, and test the finished product. It also takes more time to achieve a consistent/stable population in wheat. In the market, wheat suffers from a perceived lack of interest in variety based on the more subtle differences in wheat quality and flavour, leading to a perception of fungibility and homogeneity among wheat varieties. It lacks the clear aesthetic differences and appeal of potatoes (among other factors) that lead people to develop preferences for specific potato varieties or a desire to try something different.

#3 was approached by AAFC at one point about working toward registration with a few of his lines, but there are barriers to the ability and desire to register a potato variety. He perceived it as a daunting, labour intensive, and long process that didn't make sense to him as a small farmer - his response being "Whoa, no, why would I touch that?". #3 thought it might make sense for a commercial potato seed

producer, but other than that did not see registration as applying to him, especially because his market orientation allowed him to sell his potato without registration. Notably, he mentioned that he would not want to apply as the main applicant or owner of the variety.

At his scale, a more relevant barrier for #3 was maintenance of the population - especially regarding increasing generational viral load and continued propagation. He noted it was one of the few crops for which he couldn't save his own seed, citing the feeling of obligation to buy clean seed every year. It might make more sense for a larger producer to go through the necessary steps and go through a lab to have their seed cleaned, but on #3's scale he was not supplied with information about how to handle this step and had begun to do some of his own research on small-scale potato propagation.

One final challenge was arriving at a quantity and quality consistency of potato that would facilitate wider commercialization. #3's PPB potato was not entered into his CSA market because of this variability, which created a lack of confidence in the quality of potato and an inability to dependably supply a similar style of potato if quality needs were met. Compounding this variability was the feeling of inability to properly assess/test the potato, both for description and baseline quality indicators, which is addressed in the following section. #3 notes that later generations of selection did become more dependable and familiar as they narrowed down their PPB options and increased quantities of specific lines.

Suggestions and possible approaches:

#3 had some ideas for responding to the barriers outlined above. Firstly, responding to the lack of dependability and confidence in quality when marketing, #3 thought a process for assessing potato end-use qualities would be helpful. This process would offer a clear way to compare existing potato options, for example comparing it to check varieties, and gathering data to obtain some objective opinions beyond their own. This information could include specific gravity, density, and other means to locate their potato in certain classes. This process wouldn't need to be official - just some means to assess quality, even a stand-in for official testing. Developing this capability would help develop the language around quality characteristics (ex: is it "floury"? Is it good for baking?) and the ability to describe and categorize potatoes for end-use. #3 thinks this kind of assessment is needed before confirming the value of PPB material.

#3 responded to his experience marketing his PPB potato and had some thoughts about marketing possibilities. Regarding the utility of a communication/branding assistance 'package', #3 was of mixed mind. He thought that marketing and communication needs are dependent on the crop and market, which are not uniform between producers, and therefore not amenable to a standardized approach. He also thought he had understood the program well enough to explain it, and that most direct marketers would know the particularities of their market and be in the best position to "put their spin on it." #3 had more interest in speaking with other participants about what they did and learning from what worked for them. In the end though, he thought that if you arrived at a population, you were confident with, marketing would be more a matter of just having the supply and pushing it yourself.

On the other hand, #3 thought a marketing assistance 'package' would have presented an interesting conversation for a larger producer, more at the scale and orientation of Farmer 8 (another PPB participant). He noted that standard potato varieties are well entrenched for consumers, especially in

conventional retail markets. This might require "a pretty good spiel [to] convince your sellers to actually take it" and an explanation of the cultivar's origins. In this case he saw the potential for PPB to strengthen marketability as a high quality or unique potato with a unique story, though he was ambivalent about the potential for a unique potato variety to boost sales. He cited Red Fife wheat and Yukon Gold potatoes as examples of how consumers can take interest in particular varieties, as well as #8's 'Pugly Potatoes' off-grade potato marketing.

Quotes

"It was hard to know what to say [to customers re: PPB]"

"If it had gone to that next level of - especially going like the level of having something that was named. That felt close. But like saying like, 'this is a potato, we named this, we were involved in the breeding of it.' To me that like level of branding would have been probably really helpful. Instead of just saying 'it's, you know, number 12BC or whatever' - not very tempting to people."

"I'm trying to remember. I'm sure a couple people came back and said, 'Yeah, they were great. They were potatoes.'"

"Potatoes especially - varieties are so entrenched, and people are so familiar with varieties for potatoes, probably more than almost any other crop that I can think of. So there is a bit of a barrier to push through there. And that probably would require, yeah, a pretty good spiel for the, you know, convince your sellers to actually take it."

"With the potatoes that first opportunity to register was just like, oh, that makes no sense. Maybe that would make sense if, you know, I was a seed potato producer, but that, it felt like that was the only circumstance under which it would."

PPB Value Chain Discovery Case Study – Farmer 1

Participant Overview:

Farmer 1's farm is a 3500 acre certified organic grain farm, producing wheat, alfalfa and pulse crops. They rent 1200 acres of permanent native range-land pasture to their neighbours. #1 is heavily involved in agricultural politics and is active in several farmer/agriculture organizations. He sees PPB as insurance programme or protection against the monopoly of seed ownership by private companies. He cites the registration of a couple of varieties out of the program as an important objective as it would provide an opportunity for farmers to "freely exchange seed and sell seed to each other." He thinks the program has been tremendously successful so far.

PPB Context:

#1 has been selecting from three separate Hard Red Spring Wheat lines for nine years, growing generations three, four, and five. He has scaled his populations up to the point that he is seeding acreages - an acre in total of two different lines in 2020. In 2021 he was preparing to plant seven acres total of two lines in two plots. His third line is one year behind the other two. His breeding priorities are not different than those for his other crops - e.g. disease resistance, yield, and end-use quality. He is at the point of having to think seriously about marketability and is looking towards increased testing, ramping up production, and contacting buyers if the tests are promising.

CURRENT MARKETS AND PPB COMMERCIALIZATION PROSPECTS

Current Markets and Value Chains:

Farmer 1 markets their wheat through organic grain brokers, many of whom were farmers marketing their own production to millers and distillers who then began buying and distributing grain from other producers. They have different perspectives and orientations towards pedigree and registration. He thinks there may be some room for identity preservation even of full train cars depending on which mill and retailer they are going to, and he notes the existence of identity preservation inherent in organic production, because the organic provenance of a product must be maintained through its life cycle.

Organic grain markets are more flexible with registration, but also more precarious, and #1 has identified a tendency for all-or-nothing valuing of organic grains. In other words, the same spectrum of gradation that exists for conventional wheat quality categories does not exist for organic wheat. In this situation, a wheat that does not meet the top-quality criteria is more easily relegated to bottom tiers of quality such as feed, and the price fetched by the farmer drops precipitously.

There is a dynamic between risk and reward in this market, in that larger and more dependable brokers will offer a lower price, but higher prices and greater flexibility can be found through smaller or

independent brokers who also carry more risk. Smaller brokers might not have the track record of larger companies, are less capable of absorbing losses, or might pay only after your grain is sold. Spoilage in transport or quality issues resulting from a botched order are examples of a grey area that exists at this scale, resulting sometimes in litigation over who is expected to absorb losses.

#1 has noticed a recent shift towards organic buyers asking for variety name as a quality assurance step, and attributes this to quality control issues after the dissolution of the Canadian Wheat Board. Organic buyers used to rely mostly on testing specifications for quality, such as falling number, protein, and the presence of fusarium-induced DON. In this shifting regulatory landscape, buyer's requirements of certification, testing, and quality assurance are fluid, which will create some uncertainty for PPB populations entering the market.

PPB Commercialization Status and Intentions:

Like other PPB participants, it is too early in the process for #1 to say with any certainty if and how he will commercialize. Nonetheless, if the population is attractive to buyers and processors, the main outcomes for this line would be either purchase by #1's grain brokers or registration if it is of superior quality. At this time, he has not contacted value chain partners or customers about his PPB population, but the coming year will require decisions to be made about the testing, potential, scaling up, contacting buyers, and commercializing of his PPB line.

Understandably, #1 cannot be certain of the commercialization process for his PPB line, but he envisions some form of iterative process involving testing, trialling, approaching buyers and processors, and scaling up if it continues to prove desirable. The process certainly begins with testing though; quality testing for protein, falling number, and DON levels as well as processing trials for milling and baking. The Canadian Grain Commission does this kind of testing, including free falling number and DON tests, and can possibly do some early baking trials. #1 is certain that buyers will request samples to do their own testing regardless of early positive results.

If the numbers continue to come back in acceptable ranges, then approaching buyers and processors starts small. Perhaps a couple of smaller brokers to do some testing, or a few individual bakers to try baking it. #1 believes that acceptance from processors and buyers is the front end of commercialization and the only route to registration. If a line cannot pass this point, it will be the end of commercialization at least on a large scale, and it will exclude it from registration. He does not anticipate a particularly negative reaction from buyers to the idea of PPB, especially if the quality is what they are used to. He also does not anticipate buyers deriving any particular benefit from PPB from a marketing/branding standpoint for example.

Barriers to PPB Commercialization:

The main barriers to registration highlighted by #1 are the requirement in the registration system that varieties be "Distinct, Uniform, and Stable" ('new' is another more recently added requirement) as well as uncertainty about the process. Referring to the 'evolutionary blend' (which is a mix of all the PPB lines),

he notes that "when you've got 43 different lines all in the same mixture, you have the absolute opposite of anything that is distinct, uniform or stable." #1 was also uncertain about Bauta's familiarity and timeframe concerning the registration process, including their situation concerning support from credentialed plant breeders to support PPB in registration.

For unregistered PPB populations barriers are related to purchaser risk, uncertainty about testing protocols, and the risk of loss-of-premium for organic farmers if their quality is slightly off. If grain brokers are dealing with much volume, they cannot risk uncertainty about the quality of grain they are buying. This requires testing, and a dependable product, but #1 is uncertain about the process and protocols of testing. At the Canadian Grain Commission for example, he wondered if 'just anyone' can pay for quality testing and sample baking runs. Where to test, who can test, how to test, and costs of testing are still uncertain and potentially prohibitive.

A risk for organic farmers in PPB is that, as previously mentioned, in the organic market one can lose the organic premium quite easily with slight drops in quality. If there is any instability in a PPB population, the farmer is exposed to this risk.

Finally, there is the issue of PPB grain storage, which is not strictly related to commercialization, but the farmer needs to have a sense that it will sell to justify storing volumes beyond a 40 bushel tote. After the 40-bushel mark #1 requires the use of a granary which commits large storage potential (2000 & 4000 bushel capacity per bin) to a small amount of PPB grain. This represents capital investment and opportunity cost because this cuts down on the available storage for the marketable grain to be harvested that year. #1 will likely not seed his full 200 bushels of PPB seed because it would produce too much without a clear opportunity to sell it.

Suggestions and possible approaches:

#1 mentioned several things that could work to address barriers and enhance the possibility of PPB commercialization. Responding to the challenge of the "Distinct, Uniform, and Stable" requirement of the grain registration system, #1 appealed to new classes in the system as well as the possibility of developing new streams aside from or in addition to the existing ones. He mentioned some kind of 'general purpose' class as a catch-all for populations that don't meet other class specifications which was added in the last couple of years. He also wondered about the possibility of new streams that could recognize smaller volume and uniquely distinct products for their merit beyond pure agronomic performance.

An approach to the problem of risk in PPB is both to start slowly and to collectivize the development of registration and markets. He referred to the potential of small collaborations (called co-ops or otherwise) of farmers and researchers working together to learn the requirements of registration and move PPB populations through that process. There is also potential for collaboration in marketing, with farmers pooling quantities of PPB lines to reduce risk for the individual and meet quantity requirements. This could also start with the involvement of a dedicated broker partner with an interest in PPB itself who could receive and exclusively market the initial volumes of PPB grain. #1 notes Red Fife as an example of a grain that has met with success in specialty markets and developed close connections between farmers

and processors. They advertise a specific grain and appeal to its distinct flavour and quality characteristics.

Quotes:

“Because if a buyer has a bad experience with some of their grain, and the loaves of bread don't rise the same or they don't do something - that baker's going to want to know why. What was that grain? What was the protein? Did you actually ship the protein to me that you said you were going to ship? These problems are going on in the larger Canadian system now.”

“My initial reaction is 'no', that there wouldn't be any way they [purchasers] could derive any extra benefit from trying to advertise it as a PPB produced grain. I know, for instance, in the real specialty niche marketing with varieties like Red Fife, for instance, they are growers there, and the bakers they work with are able to advertise the fact that it's made with Red Fife. And they talk about, you know, potentially different taste or other different qualities of the finished product. But at this point, I'm not expecting any of that to be any sort of an advantage for the PPB varieties that we have. So I'm not expecting any extra excitement on behalf of our buyers in that regard.”

PPB Value Chain Discovery Case Study – Farmer 5

Participant Overview:

Farmer 5's farm is a 170 acre grain and potato farm producing milled flour primarily. They have six different types of mills, one of which is the primary which is running full time. They mill a variety of grains including gluten-free. They also crack grains and sell rolled oats and oat groats. #5 also volunteers as the miller at the Old Stone Mill National Historic Site in Delta, ON. His potatoes and potato seed are now sold almost exclusively to home gardeners. They have mostly stopped selling at farmers markets, and now work more with wholesalers, restaurants, and bakeries.

Additionally, the farm produces hazelnuts, pecans, and several kinds of rhubarb. It houses 98 apple trees for cider and is preparing to run a U-pick and cut-flower business. They follow a variety of regenerative practices designed to establish ecological capital and they devote a significant amount of time to this pursuit. #5 has become increasingly active as a seed breeder, working with hundreds of lines of heritage wheat, potato, legumes, other grains, and soybeans - which includes his PPB lines. He is in the process of winding down "farming for food" and intends to focus more on seed research and production as a "seed house" while still bringing in grain for the mill. He began bringing in organic grain from the prairies in 2020 to meet the demand resulting from increased baking interest during the COVID-19 lockdowns.

PPB Context:

#5 has been selecting for wheat and potatoes and briefly worked with an oat cross early in his PPB participation. He started with, and still maintains, four wheat crosses - all of which contained Red Fife ancestry. He has arrived at 25 distinct potato lines and is now yielding between five and six hundred pounds of each. Working with Helen at the Bauta Family Initiative, he has sent six of those for alkaloid clinical testing, and one line in particular did not appear to contain any glycoalkaloids at all.

PPB fit well into #5's existing breeding practices which include pushing his genetic material by exposing it to unfavourable conditions and pressure/stress. Instead of high yield, his priorities are breeding for resiliency and stable yield in an unstable environment. For wheat he grows for thick straw (carbon sequestration), head retention, and drought and wind tolerance. For potato he's looking for them to set fruit and for them to store well to avoid spraying.

A next step will be quality testing and assessing the culinary features of both his wheat and potatoes as they approach the point where they can be sold. He has arrived at traits that he likes and is especially happy with two of the wheats. #5 became quite ill in the spring of 2021 and was unable to get his potato crosses in the ground but hopes they will survive another year in the cooler for planting in spring 2022. (Since this interview, #5 did seed these microtubers but still lost 95% of his potato seed stock.)

CURRENT MARKETS AND PPB COMMERCIALIZATION PROSPECTS

Current Markets and Value Chains:

Milling and selling flour constitutes approximately 90% of the farm's gross revenue, and #5 is increasingly bringing in organic grain from the prairies for the mill at about half the total cost of growing it on farm. The main market is now five 'craft' bakeries which receive roughly \$1000 deliveries around twice a month. #5 notes he would have room for a couple more craft bakers if needed, and that the demand for locally milled organic wheat outweighs the supply. He does do personal/household delivery runs a couple times a year in southern Ontario and is trying to convince more customers to buy home mills so that he can do larger deliveries of un-milled grain.

He has restricted his sale of potatoes as food because of CFIA scale limitations and is now selling mostly as seed to avoid this problem, a choice facilitated by the acquisition of a plot sized combine. This ties into his desire to operate more as a "seed house" and through this he intends to market 4 or 5 new potato lines and also respond to consumer interest in growing their own small grains. He notes growing online popularity and interest in his potato seed, particularly through Instagram. He sums it up well when he says "the more obscure the story on our website, the more sales we get!... people are obviously hungry and fascinated for that variability by history." #5 has a close relationship with his restaurant-bakers, particularly at "Restaurant Pearl Morissette", and they are small enough and of a market-orientation to leverage locality, identity preservation, and seed provenance.

PPB Commercialization Status and Intentions:

#5 has not yet marketed a PPB population, but will likely mix it in with his current activities and is not anticipating regulatory complications from this. He believes the successful commercialization of PPB will hinge on marketing - having an interesting name or a compelling backstory and leveraging the ideas informing PPB to hook initial eaters and penetrate the consumer market. He has named his PPB wheat lines, which could contribute to their marketing.

One of his ideas for commercializing PPB would be to have an exclusive sponsor of one of his lines to allow for the normalization/validation of PPB. This is helpful for three reasons: one is that his current restaurant-bakery customers are small and dextrous enough that they can accommodate an 'unusual' product or limited offering of a product. Two is that they have diversified offerings so can accommodate the price increase of PPB wheat or potato by incorporating it in other dishes or absorbing the cost increase in their other offerings. In other words, if all you use is flour, then increased flour costs could not be offset. Lastly it allows a platform to communicate the PPB project to consumers - and the consumers at these 'craft' locations are likely there with an interest in the background of their food.

#5's main collaboration is with "Restaurant Pearl Morissette" in Niagara. They are aware of his PPB work and are capable of working with the baking quality variability that it may present. They have invested time visiting each-other's sites, meshing and discussing their needs and requirements to better understand one-another's role in this process. This kind of collaboration is novel to both baker and farmer.

#5 did mention that he has a lot of requests for seed from people who intend to start their own acreage, but that he would like to see back his sweat equity from the work of breeding and bulking. This could be done by selling at a high margin to specific food processing clients for a certain amount of time, allowing the cache for that population to grow before making his seed available to others.

Barriers to PPB Commercialization:

Most of the barriers identified by #5 are already barriers in organic production more broadly, and will be discussed. The only specific PPB barrier stated by #5 is that if he were not bound by regulations, he would already be selling his PPB material as seed. Otherwise, he has not come up against any regulatory barriers, is aware of the regulatory requirements in growing and processing, and does not flirt with these boundaries.

#5 has many other seed breeding projects in addition his participation in UMPPB, and for all of these activities he cites an opportunity cost of putting time into seed breeding. When he is working with seed, he is not carrying out other revenue-generating tasks on the farm. Though he is passionate about plant breeding, it is a cost that must be considered.

Suggestions and possible approaches:

#5 advocates for the development of partnerships – mutual investment in value chain collaborations for the commercialization of PPB. Getting a PPB population to chefs and bakers, or even cultivating a relationship between farmer, miller and baker will be essential for penetrating the market, especially if PPB is being sold at a premium. This is outlined somewhat in the “PPB Status” section. An addition to what has already been mentioned is the necessity of value chain actors understanding each other’s role in the process to better meet each others needs.

#5 also advocates exploring new demarcations of scale and quality in registration to facilitate the recognition of heritage, local, organic, or socially significant germplasm. He cites a 2019 CFIA garden variety potato registration exception which allows for the recognition of unique potato cultivars that otherwise would not qualify for registration, as long as they stay within production limits. He believes a similar exception could be made for grains.

He offered two commercialization ideas that could be carried out by BFICSS. One is the creation of an agricultural “dating registry” (akin to online dating/matching platforms such as Tinder) that could connect the needs of producers and processors – possibly even amalgamating yield and combining efforts. Similar to the online map produced in this project, this registry would feature producers and processors on the landscape - outlining their capacity, their needs, their production, and allowing them to seek compatible needs from other participants. This facilitates the development of partnerships and allows smaller operations to grow in combined strength. It is applicable beyond PPB, but could be useful for these

purposes. As examples, he spoke of small bakeries being enabled to connect with small local producers, or smaller producers finding each other to collectively meet the capacity of larger processors.

For UMPPB and BFICSS specifically, he thought that a matrix chart of participant priorities and commercial intentions would be helpful to delineate the needs of participants and bring intention to the output of the program. As an example, he cited the difference between specialty producers seeking distinct flavour and quality characteristics and producers seeking strong agronomic performance but standard quality profiles.

#5 considers options for reducing the end-point cost of PPB crops, and sees this as essential for their long-term viability. PPB may enter the market at a high price-point through collaboration with local baker and chefs, but at the same time, the overall cost will have to decrease if PPB products are to become accessible to more people. He envisions a dynamic where he produces seed in Ontario and sends it to the Prairies where they can grow it at a large scale and then send it back to his mill in Ontario by rail. With this revenue he would fund his seed production and research and deliver even more seed to the prairies. #5 sees this as a “critical way to get to the market at a price point that people aren't gonna balk at” but at the same time sees the need to balance this arrangement with maintaining local grain growing capacity.

Quote:

“I think that will be the biggest thing with the cereal crops at large [especially the field crops] is to come up with an equivalency to that 2019 potato garden potato variety and call it the garden artisanal grain registry where we celebrate all these old varieties in the context of a local food system, local bakery system, and local milling system.”

Chapter 3: Critical Reflection

Introduction

This project took two years to complete after an initial two years in the MNRM program taking courses and attempting to establish a research proposal for a thesis on this same topic. In the completion of this project, I have gone down rabbit holes, encountered dead ends, distracted myself with work, climate activism and music. But—at the end of a total of four years of study, I have cultivated at least some knowledge and experience.

Reflecting specifically on the last two years of project management in the practicum stream, I experienced a range of successes and failures, ‘teachable moments’, and breakthroughs. I also developed my understanding of project management and deepened my knowledge of PPB and agriculture.

What follows is an unpacking of the knowledge and skills gained, and the lessons learned, in the process of planning and delivering my MNRM practicum project. I will first explore the process, experience, and outcomes of project execution. Then I will reflect more broadly on the knowledge and skills acquired, and the contribution made, through the production of project deliverables.

Project Execution

Project Plan Development

The project plan was developed out of the NRI Project Management (PM) course, which followed the internationally recognized Project Management Professional curriculum/handbook. I am grateful to have covered in-depth so many elements of project management, especially those that would apply to larger projects with many stakeholders and moving parts. The outcome of this course was a thorough project plan, dense with mechanisms for effective planning, communication, risk management, and execution.

Nonetheless, trying to apply all the elements of such a thorough model in the production of my final project plan for the Bauta Family Initiative on Canadian Seed Security (BFICSS) and the University of Manitoba Participatory Plant Breeding project (UMPPB) was a mistake. It would have been corrected by simplifying – possibly starting fresh and developing a project plan that was appropriately scaled to the size of my project.

To be sure, the project management course had a desirable breadth of exposure to PM core concepts for learning, but I misjudged the applicability of the totality of these concepts to my small project. The preferable approach would have been to use PM structure as a guide – to consider the needs met by the various sections, steps, charts, and mechanisms and then meet those needs in a less cumbersome format. (Which I believe we were at liberty to do.)

I believe taking this step would have resulted in a more readable and practical document for my project team and a more realistic system of oversight, management, and quality control. After all, the project is being managed and delivered for the project partner, so it should be useful and accessible to them. As an example, discussions of cost arise at multiple points in the project plan, e.g. assets and budget sections. Differentiating between these sections serves a purpose when dealing with larger sums, but in this case could have been reduced to one section to meet the need of ‘managing money’. Another example is the description of people involved in the project and their roles which is housed in sections such as ‘directory’, ‘roles’, and ‘assets’. These sections could have been titled ‘who is involved’ and met the

underlying needs of making sure people see how their responsibilities fit with those of others and what is required of them.

Charts, logs, and other tracking tools to be used during project execution also occupied a lot of space in the project plan, which could have been confusing and overwhelming for a team that had limited time for the minutia of a student practicum. Personally, I could not and did not end up keeping up the use of many of these tools, especially after deliverables production started in earnest.

Management of the most specific activities of project execution is emblematic of this challenge; A detailed project task breakdown and enumeration exists in the activity list, milestone chart, and project schedule. What was needed was a practical way to break down and track specific project tasks and keep them on track, but what I delivered was a series of interlocking lists that became obsolete when a change in one of them required a change in all of them.

Simplification, starting at the project plan, would have provided nimbleness in response to change, a more accessible organizing space to keep manager and team on the same page, and it would have avoided redundancies. In the future I would remain cogent of the fact that the plan exists for the project team and that it should meet their needs in a streamlined and manageable way.

Communication

Initiating communication with the project team (c/o Martin Entz) was an exciting step which brought the project from a 'guesstimated' mockup plan based solely on research and limited discussion to a real-world discussion of the needs of UMPPB farmers and the BFICSS. The need for clear communication with participants and the project team was continual. It was a point of personal development and an enjoyable part of the project. It was also a stressful and time-consuming part of the project, especially in managing change. The art and skill of communication in this context cannot be understated, and I am grateful to have learned about its importance by putting it into practice during the execution of my project.

Early communications were part of the process of iteratively rounding out the needs and interests of BFICSS. I found this process quite satisfying and intuitive using the PM process of meetings that result in a series of progressively more well-defined project scoping documents. (E.g., project concept document establishing the basis of shared intent, followed by project charter which laid the scoping groundwork and gave the go-ahead for project plan development.) These documents may have been slightly excessive in length and repetition for the needs of BFICSS, but the process was valuable for my learning.

Effective discourse on needs and concerns was crucial in many aspects of plan development. A notable case happened when a risk to farmers based on possible contravention of agricultural regulations put the ethical communication of the findings of this study into question. The risk was identified, communicated, discussed, and mitigated before it became a problem. Other points such as the need for regional diversity and crop diversity in data collection, as well as avoiding overlap with other researchers were brought to light through persistent inquiry and active listening.

Continual changes during project execution also demanded effective communication to ensure the project moved along and satisfied desired outcomes of project partners. Throughout the project, I became comfortable with ensuring documentation of all changes in the change log for future reference. I also became comfortable identifying when or if changes would require inputs from participants or the project team.

During the project, a specific moment stands out that required effective and clear communication between me and all involved in the project. This was when it became apparent that value chains did not yet exist for PPB crops, which impeded the intended project plan to depict and describe these value chains geographically. Through collaborative communication, we developed a solution in which participants' existing non-PPB value chains would be described, their prospects and intentions for PPB commercialization explored, and their individual experiences with PPB displayed in a series of reports instead of an online interactive map.

Reflecting on my personal communication during this project, I can recognize a slow but steady increase of my own progress in good communication as I gained familiarity and comfort with my role. Initially, I was slow in my email correspondence due to what I see now as trepidation. More specifically, I wanted to ensure I was communicating clearly and concisely from the beginning, not including too much or too little. I understand now that this was a skill I would continue to practice throughout this entire project.

My pace in communicating improved as relationships with participants and partners developed and I felt more comfortable in my writing. Throughout the project I can spot changes in my communication habits. I moved from a place of irregular communication (either obsessively checking emails and getting distracted by correspondence or delaying on correspondences that felt uncertain or unpleasant), to a feeling of balance in correspondence.

A tool that helped me develop more positive correspondence patterns was both tracking and prioritizing communication. Developing systems (like excel tracking sheets), allowed me to allocate my time to ensure I was proactively and productively upholding communication from my end during this project. Personally, this was key to ensure I did not carry guilt of having forgotten to respond to someone. It also helped me to divide my time and tasks by focusing on one correspondence at a time instead of feeling overwhelmed by simply having too many emails!

Task underestimation

Most of my delays were related to underestimating the time it would take to complete tasks, and the sub-tasks included therein. It is an act of imagination to sit down and think through everything that could come up, everything that could complicate a project, the many ways that work can expand. I took things at face value, only seeing the surface or the tip of the iceberg and failing to imagine what is underneath or what goes into relatively simple looking deliverables. It would pay moving forward to incorporate the inevitability of unforeseen demands prolonging and expanding project tasks that appeared simple.

In this case I'm not sure how much research would have spared me from task under-estimation, but I understand this is a key part of work estimation in PM. Speaking with experts in the field, searching for related projects and figures, and identifying corollaries that may indicate the demands of a project and its subsidiary tasks. There also appears to be an art to landing on the appropriate level of vagueness in the plan, allowing for inevitable changes and emergent factors but still putting some borders around a task and offering specificity where possible.

One example of task underestimation is the French translation of outreach documents and the interview format. I thought it would just be a question of writing these things up in English and then simply paying an agency for translation - but there were complications. The interview format changed drastically after the first interview, which I tried to accommodate by making the changes to the French document myself.

Then there was the task of communicating with my French interviewee and getting my French interviewer up to speed with the subject matter of the interview. This created far more work than I anticipated.

Methods - Data Collection and Analysis

Defined and intentional methods are surely one of the best ways to properly scope and approach the work of a project of this size. Through project execution I learned about and gained practical experience in planning for data collection and analysis. I also found the data collection (interviews) to be a strength of mine, and something I enjoy. Judging from the positive feedback from my committee, I also developed confidence with data analysis, though I cannot say it was as enjoyable as collection.

Though less formal than a thesis, my practicum still could have benefitted from a defined method of analysis – a clear process that takes the uncertainty out of how to proceed with collection and analysis. This is not to say my methods did not deliver interesting and relevant results, but that I could have saved some time and energy applying a process instead of feeling my way through the data and ruminating on how to treat it. Specifically, I could have drastically reduced my workload by avoiding the verbatim transcription of interviews which, though thorough, were challenging to produce and left a surfeit of data to work with. Reading about and selecting the right method takes some up-front time and work but saves so much work in the end.

When I think of the size of the original interview schedule, it reminds me how much I have developed as an interviewer. After reducing the schedule a considerable amount and conducting a total of thirteen interviews (including three supplementary interviews with industry informants) I began to feel confident and excited in interviews. I began to look forward to learning from and connecting with participants. I had multiple participants as well as my project partner remark on the quality of questions and follow-ups, as well as the quality of the data coming out of the interviews. This kind of feedback is very encouraging and gives me the confidence to carry out data collection in a professional setting.

Competency Development

I developed varied competencies by carrying out this project and taking responsibility and leadership within it. This includes developing as a writer and communicator and becoming more adaptable with the number of changes that occurred through the project. Additionally, my command of digital technology was expanded and challenged.

I developed substantially as a writer during the completion of this project, primarily by adjusting to the size of the report. I realized that I could not fuss with each piece as I would in a smaller course assignment or the report would simply not get done. I can remember times, even in my masters coursework, when I would struggle to proceed with even a two page report. The volume of writing that this project demanded meant that I had to learn how to write efficiently - namely writing freely from my mind and experience and using the editing process to refine further writing.

In the past, I would struggle with individual paragraphs and get completely stuck trying to contain all the ideas I wanted to in a small space, or to relate multiple ideas in a small space. Now I feel far more comfortable writing naturally, knowing that I could return later to the writing, and trusting my knowledge

and experience, and that I would eventually cover everything that was important. This has led to writing with greater clarity as well.

Another challenge posed by this project was the flow of new information from data collection, and the need to write based on current knowledge and adapt accordingly as new information came in. The periodically changing nature of this work, as new concerns were brought forward and new information became available, forced me to become more adaptable. The goals of the program were adjusted a few times - some for the better, as when we decided to eliminate the interactive map component, and some in more challenging ways, as I discovered that there were not yet value chains for PPB crops. Through completing this project I have come to expect change and be ready to adapt to it.

Finally, I learned to use digital technology far more effectively through the course of this project. Even in applications as ubiquitous as Microsoft Office I was forced to expand my skill set and try new things. Examples would be learning to use track changes in Microsoft Word - something I had not been exposed to before - and even just becoming more familiar with the design and formatting capabilities of Word. I expanded my knowledge of Excel by creating the project schedule in the form of a GANTT chart, which was large, and demanded a brush up of Excel programming competencies. Lastly, I was exposed to OneNote as an organizational tool, and found this to be invaluable to organizing, simplifying, and visualizing information and project tasks.

There is a collection of additional digital applications that I was exposed to through the course of this work. I became proficient in the use of Otter AI transcription software to transcribe and annotate my interviews and learned to record interviews through Zoom. I also looked at a variety of digital project management tools, ending up on Slack because that was what BFICSS was using. This kind of software is used ubiquitously in organizational management to organize work and communicate, and I anticipate I will have to engage with software like this in the future. A final technology I was grateful to be exposed to was GIS through the use of the ArcGIS platform. Though I did not end up being required to complete an interactive map, the time I spent on tutorials and developing the map was not insignificant and I'll be ready to follow through with this base of understanding if it is needed in future projects.

Contribution and Knowledge Development

Who has the power to change things?

Value chain research is supposed to help investigate the question of “who has the power to change things?” within a value chain. (McCormick & Schmitz, 2001) Change - in this case - is the commercialization of PPB populations, and power is the ability to move PPB towards this goal. My finding is that the question ‘who’ is misleading in the context of a complex, multidisciplinary, multi-stakeholder system like agricultural markets. ‘Who’ suggests that there is one person who holds unilateral decision-making power, and if they can only be swayed, the desired changes may be implemented. ‘Who’ ends up being many people, and power ends up being created, invented, and mobilized.

The people with the power to “change things” exist in multiple intersecting circles. There are people with power to push for PPB commercialization, and there are people with the power to facilitate it. UMPPB farmers, especially moving in concert, can popularize PPB and introduce it to purchasers/consumers, especially with the support of the BFICSS. This constitutes a push towards commercialization.

Additionally, there are value chain partners who can exercise discretion in their choice to adopt PPB populations or not. This is another example of a group of people not necessarily having the power to flip a switch and commercialize PPB but having the power to make choices that move PPB closer to its goal.

On the registration and regulatory side, the BFICSS is involved in the CFIA Variety Registration Task Team – a group convened to address issues in the variety registration system. BFICSS acts as one part of this team with multiple (sometimes competing) interests and therefore has ‘power’ in this context - not to make unilateral decisions, but to influence the perception of PPB and negotiate paths for its operationalization.

Breeder Farmer Interactions Limited to Technical

Part of this work was responding to a documented habit of researchers to focus on the task of breeding but to leave out important underpinning communications about goals and broader socio-economic factors. (Sperling et al., 2001; Weltzien et al., 2003) Looking at qualitative research carried out on UMPPB by other researchers and the BFICSS, it appears to me that UMPPB and BFICSS have not been deficient in searching to understand the social and economic aspects of their project. Iain Storosko carried out a thorough investigation of the goals and motivations of UMPPB farmers, and BFICSS staff had substantial knowledge of these aspects that helped me frame my research. I also found BFICSS research that was attempting to answer these questions.

Instead of filling a gap, my research has augmented and consolidated UMPPB and BFICSS understanding of participant goals for commercialization and their market contexts. Some participants in my research expressed gratitude for the line of questioning I opened up and found that our discussions lead to them considering socio-economic factors they had not considered before. We explored not only commercial goals and prospects, but the avenues by which those goals might be achieved.

My hope is that this work has stimulated the consideration of next steps and offered some starting points or structure for further exploring this topic. The collected experiences and observations of participant farmers thus far already contains enough information to allow initial commercialization steps to be taken with confidence.

Sustainable Food Futures

What this research has demonstrated to me about resilient food futures is that there are no silver bullets for the world’s agricultural conundrums. No single innovation or approach to agriculture that constitutes an ‘answer’. I have observed enthusiasm about a multiplicity of ideas and strong beliefs in specific remedies. The limitations of this can be a tendency to dismiss other ideas, valorize one’s own, and pursue a ‘monocropped’ solution in the agroecosystem of ideas.

Organic agriculture (OA) is the quintessential whipping-boy – the punching bag – in the ecosystem of sustainable agriculture solutions. I refer to the oft-referenced paper “Organic Agriculture Cannot Not Feed the World” (Connor, 2008) which is not ‘wrong’ but also conceptually sweeps away an entire field of ideas for those who wish to deride organic concepts as a whole. Organic approaches applied to otherwise standard-model agricultural industrialization may indeed not meet the current output of global agriculture, and this will spur a full dismissal of the idea if the only paradigm applied is one that values yield above all else. The underlying principals of OA and the grains of truth contained therein go to the landfill in this ecosystem of ideas.

Inversely, in many organic circles which mean well and seek sustainable alternatives with more farmers, large-scale, conventional, or industrial agriculture can be derided or dismissed as an unviable food future. But there are ecological efficiencies that can be gained by practicing agriculture on a larger scale. Take for example the inefficiency of 25 pickup trucks moving vegetables into the city for deliveries as opposed to the more efficient movement of one semi-trailer of produce to a grocery store. Also, there is the reality of dwindling rural populations and interest in farming. Even if the ideal scenario was to have more people on the land producing food, there is not enough interest or available labour for this to become a reality on any scale.

I'm grateful for the opportunities I've had to see Dr. Entz speak – at the Soil Agronomy field school, the National Farmer's Union, and within the faculty of agriculture. To me he exemplifies the non-judgmental search for multiple interwoven multi-scale solutions in agriculture. Though a proponent of Organic, Martin does not vilify 'conventional' agriculture or hold Organic out as a panacea. He invites people into a discussion, and explores myriad innovations and approaches in the search for effective solutions.

What I envision is a multiplicity of integrated techniques and innovations employed in concert and in connection with each other – a multi-level web providing the redundancies of a resilient food system and creating synergy amongst each other. The weaving together of scales and solutions based on the needs of a place – be it export agriculture, or local provisioning.

Reconciling theory and practical reality

Delving into the practicalities of PPB commercialization was an effective lesson on the divergence between the hopefulness of theory and the messiness of lived experience. I reviewed the literature thoroughly for this project, having nearly completed a literature review for a thesis proposal, and still entered data collection with wide eyed optimism and massive gaps in my understanding of PPB.

The symbolic example of this, which I am loathe to admit to, was that I believed farmers were tailoring the quality characteristics of their populations alongside value chain partners like chefs and bakers. I thought they were busy pursuing unique or desirable qualities like perfumers honing in on their masterpiece, and that a farmer was capable of tweaking their wheat to make just the right bread. I discovered that, despite reports from other regions of PPB collaboration, there was nobody adding just a bit more sweetness to their wheat or mashability to their potato.

Collectivity and community

DaVia (2015) speaks about collective structures and decommodified exchange networks used to disperse PPB, and the idea of the 'collective' is alive and well with UMPPB participants. Firstly, PPB farmers are largely not interested in the royalties of ownership. This is in line with previous BFICSS findings, as in a 2015 survey that found:

"The general sentiment among farmers was that they would prefer to maintain and select the populations generated from the program on their own farm as an on-farm population. If variety registration were to be pursued as an option for promising populations, farmers generally felt that any royalties generated from the sales of commercialized varieties should be reinvested into the PPB program." (Organic Seed Alliance, 2016)

This is also in line with PPB commercialization research on a project in the US that found it both “financially impractical” and “antithetical to the project’s aim” (Colley et al., 2022) to seek restrictive IP and plant breeders rights. They do not look to individual ownership for the commercial application of their population.

There also appears to be some hesitation from farmers about official collective structures or “co-ops” to manage and market the output of the PPB program. There are costs associated with such structures for one, which could create heavy and un-maneuverable organizations and perhaps even stress in management.

Most participants envision some version of germplasm sharing coming out of the program - a more unofficial system with the help of the BFICSS. UMPPB germplasm is being tested at multiple sites in Canada and is not limited to the plots of the farmers that made the initial selections. Most farmers will select from this pool and not necessarily limit themselves to the selections from their personal plots. This represents a decommodified exchange network in that royalty rights are not being claimed on specific populations, no money is made in the breeding, and yet farmer access to organic germplasm is multiplied.

It seems unclear where community and collectivity divide. These farmers are greatly motivated by the group of farmers involved in this project and I don’t think they would be pursuing it so tenaciously without the support and input from their peers. The camaraderie, the growth of learning, and the encouragement inspire the farmers beyond raw commercial potential. But the strength of this community and belief in what they are doing is what will give commercialization legs. The group lends believability/viability to PPB. The group inspires continued attempts to commercialize. The group broadens the effect and output of the program, and may produce the smaller working groups and branding to commercialize.

Conclusion

I am grateful to have had this opportunity to research and reflect deeply on a topic that is very close to my heart - resilient food systems. Engaging with participatory plant breeders and carrying out this project has changed my understanding of agriculture and the future of sustainability in agriculture far beyond the PPB specific content of this project. I was fortunate to spend time with farmers who are all revolutionizing agriculture in their own way, with their own perspectives and approaches, and this has set me up to enter work on food systems with a strong holistic and interdisciplinary foundation.

Exposure to the components of project management through this project and the project management course has provided me with a level of practical experience which I am confident will serve me well going forward. I have encountered some of the challenges of project management, seen the process from start to finish, and have gained confidence in the role of project manager.

Finally, connection with the Bauta Family Initiative and the opportunity to work with all those fine folks in a professional capacity has also been incredibly rewarding, both on an interpersonal level and a professional level. I do not think I would have had this kind of exposure in another program, and perhaps not in the thesis stream either. I have deep respect for the work they do and will feel like I’m greeting friends when we cross paths in the future.

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Appendices

Appendices Contents

Project Concept Document	170
Sequence Network Diagram.....	175
Critical Path Chart of Activities	180
Interested Parties Register.....	181
Assumptions and Constraints	183
Responsibility Assignment Matrix (RACI).....	184
Skills Inventory.....	186
Materials, Supplies & Equipment	186
Probability and Impact Matrix.....	186
Risk Register	187
Work Breakdown Structure (WBS).....	188
Activity List	192
Milestone Chart	194
Meeting Log.....	195
Change Log	200
Ethics Approved Participant Recruitment E-mail	202
Ethics Approved Informed Consent Form For Research Participants	203
Ethics Approved Interview Guide.....	207

Project Concept Document

This is the first high-level or overview document reviewed by the Project Team. It was the basis for development of the Project Charter and has not been updated from its original form.

Justification

This project is intended to promote the commercialization and dispersal of Participatory Plant Breeding (PPB) populations through the discovery and communication of PPB value chains. The University of Manitoba Participatory Plant Breeding Program in partnership with the Bauta Family Initiative on Canadian Seed Security has successfully developed participatory populations for oats, wheat, and potato. Though successful in population development, work is needed to increase the uptake and commercialization of the resulting populations.

Part of the problem is that the value/supply chains of PPB products are largely unknown. Discovery and demonstration of successful PPB value chains can offer some guidance to current farmer participants in the development of PPB value chains. It can also demonstrate realistic commercial opportunities to potential farmer participants and value chain actors. Additionally, representatives from the Bauta Initiative have expressed interest in the development of short value chains and how PPB relates to their development. Value chain discovery offers an opportunity to investigate this relationship.

Effectively communicating the findings of this value chain discovery to other farmers and value chain actors is a priority. This includes communicating both the basic flow of goods and services as well as the stories and experiences of study participants. Presenting this information in a visual, interactive, and narrative format will make case studies more relatable and accessible. Ultimately, the presentation of this study should allow viewers to situate PPB in their own contexts at various scales, locations, and market orientations.

PPB presents an opportunity to increase the security and of the Canadian seed system by building in redundancies and democratizing and demystifying the task of variety development for farmers. It constitutes a step towards seed sovereignty. Failing to investigate value chain could mean that PPB populations, which are beneficial socially and ecologically, do not extend beyond participant farmers and do not fulfil their potential to shift broader approaches to plant breeding for agriculture.

Project Description

Broad project objectives aim to document and communicate examples of successful commercialization and value chains while inviting PPB participants to share and connect with each other as well as potential value chain partners. Desired outcomes:

- Value chain discovery of PPB seed and products from PPB participant producer through to final consumers. The primary method of data collection will be semi-structured interviews.
- Descriptive/narrative multimedia account of value chain participants presented in an interactive and visually attractive map. Consider the following hyperlink as an example (see VF Jeanswear located in Nicaragua as an example of multimedia communication):

<https://open.sourcemap.com/maps/59f3a79befc1ebbd737f8a41/things/59f3a79cefc1ebbd737f8a42>

- Virtual conference or convergence of PPB participants, value chain participants, potential participants and stakeholders for the purpose of creating connections, identifying opportunities for participation/collaboration, and sharing of knowledge/approaches.

Resource and Cost Estimates (Refer to Scope Statement for current estimates)

Preliminary Cost Breakdown

Item	Cost (CAD)
Labour, Murray Jowett	6200
Travel Costs	3000
Miscellaneous	800
Total	10,000

Travel costs: \$3000 (liberal estimate)

Travel costs will depend on what interested parties deem necessary for effective implementation. They also depend on limitations posed by the Covid-19 pandemic. If data can be gathered remotely through online interviews, travel costs may be nil. Remote data gathering may also be the best option if travel is limited by Covid-19 restrictions. If effective information gathering requires travel to various sites and participation in activities, then travel costs will become a factor. These costs may include transportation (rental, gas, tickets), lodging, and food.

Labour cost: \$6200

Based on the student stipend provided by Iain Davidson-Hunt at the Natural Resources Institute, and a projected 8 months to completion beginning January 1, 2021, the cost of my work on this project is \$6200. With respect, I anticipate participant farmers will contribute their time and knowledge to interviews and workshop sessions free of charge. If interested parties including UMPPB and the Bauta Initiative see a need for compensation this can be discussed either through email communication or at the meeting regarding the Project Charter. Additionally, and gratefully, I hope that project partners offering guidance and input will contribute their work as part of their current roles at related institutions.

Miscellaneous costs: \$800

Other costs may be incurred for implements required in information gathering and analysis. Miscellaneous items may include licensing of GIS software or the rental of camera/video equipment.

Iain Davidson-Hunt (advisor) has agreed to provide project funding of a yet-to-be-determined sum.

Timeline

	2020		2021							
	N	D	J	F	M	A	M	J	J	A
Project management course and completion of coursework										
Project Charter Agreement (Advisor, Partner)										
Draft Project Plan Meeting (Advisor, Partner)										
Project Plan Approval (Advisor, Partner, FGS Member)										
Undertake Practicum Project Work (Interviews)										
Complete Practicum Deliverables										

Approval of Practicum Document For Adjudication (Advisor, Partner, FGS Member)										
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The Natural Resources Institute offers biannual practicum adjudication periods. I expect to complete this project for adjudication by August, 2021. From this date at the end of October 2020, there remains ten months to complete the project for August adjudication. The following timeline provides some broad estimates for the duration of project stages:

Planning Estimates

I intend to carry out interviews starting in January 2021, though the timing requirements of participant farmers will be the main factor determining when interviews and information collection can take place. Given the period from seeding to harvest will most likely be the busy season for farmers, I expect winter to be the opportune time for interviews. Helen Jensen (National Research Program Manager for Bauta) has indicated that a student is carrying out related value chain research scheduled to end in December 2020, making January the ideal start date.

Covid-19 travel restrictions will affect planning. If the project team decides to pursue in-person interviews or a mix of in-person and virtual interviews due to Covid-19 travel restrictions, I will be eager to carry out research requiring travel first. Hopefully, this will allow interviews to be completed before restrictions further curtail travel. Additionally, it will be preferable to conduct research outside of Manitoba first. This is because as a Manitoba resident, research destinations outside of Manitoba will more likely become restricted than those inside Manitoba.

The project timeframe of 8 months should inform decisions regarding the number of case studies undertaken as well as the depth and breadth of each study. Four months have been budgeted for interviews and information gathering, including a month overlap with the four-month period allotted to the completion of practicum deliverables.

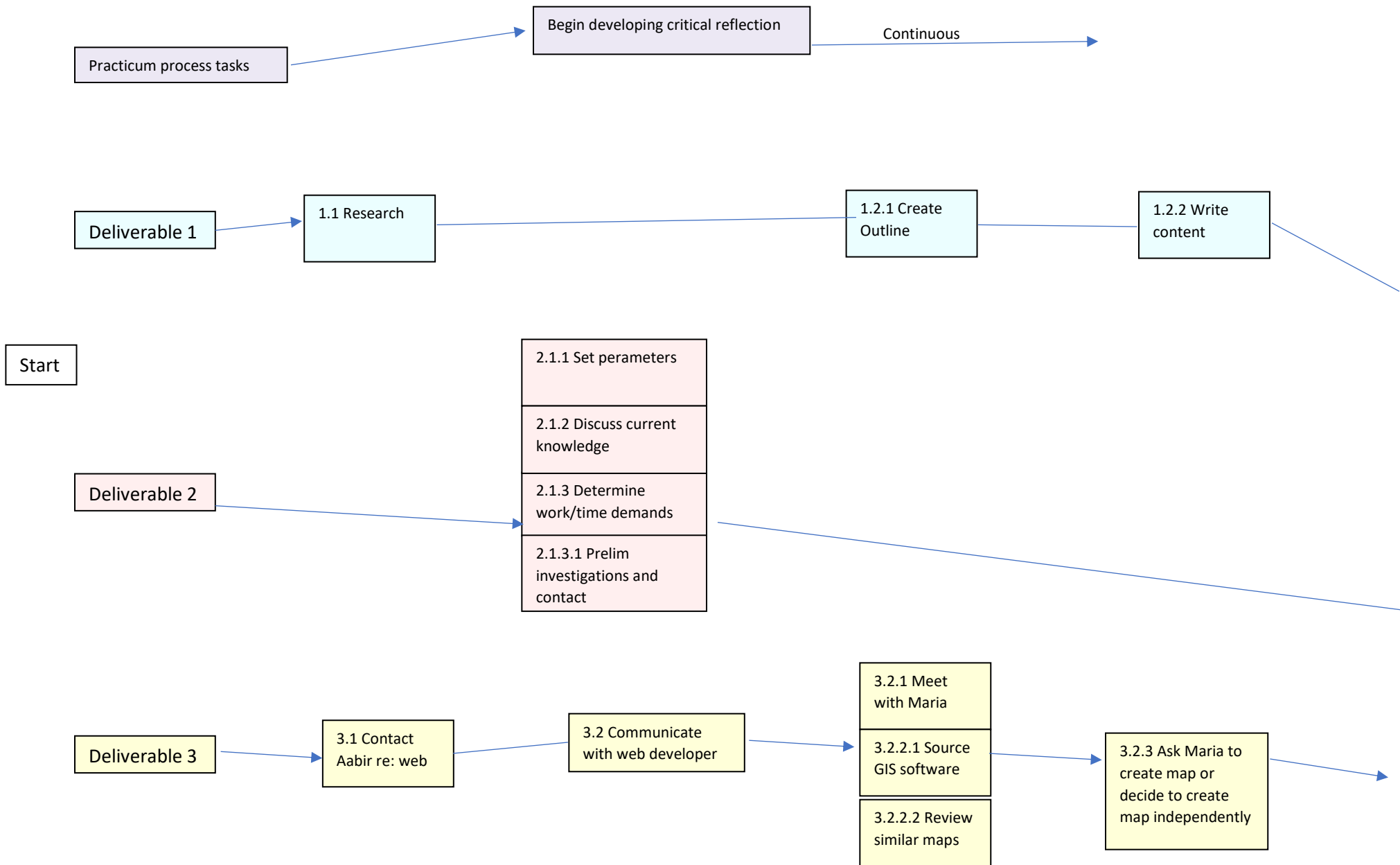
Expected Impacts

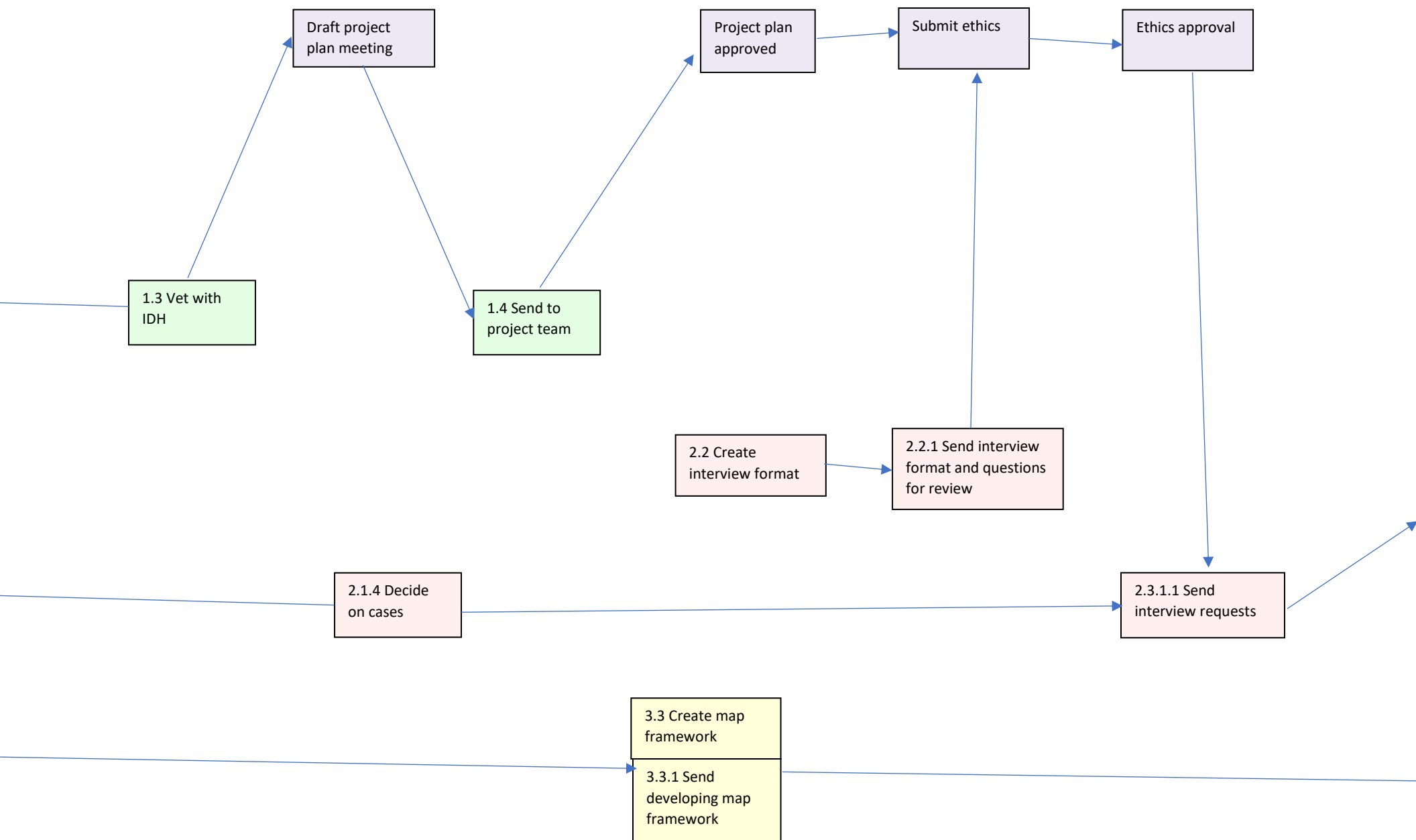
PPB participants will become more knowledgeable and connected regarding the commercialization of their PPB products, hopefully encouraging the dissemination of PPB populations and products to farmers and the wider public. This will help to normalize the idea of PPB for eaters, producers and value chain actors and hopefully support further PPB work in Canada as well as influencing the overall approach to breeding practices in Canada.

Sequence Network Diagram

The following pages contain the sequence network diagram of activities. It was developed out of the Activity List, graphically depicting the sequence of activities to determine dependencies – that is, tasks that depend on the start or completion of other tasks to be able to start or finish. It is used to determine the critical path which is the longest pathway to project completion.

*This segment is best viewed in 'side-to-side' mode in Microsoft Word for diagram continuity.





Review of deliverable outline

2.3.1.2 Schedule
interviews

2.3.1.3 Send
interview prep

2.3.2 Collect data

2.3.3 Begin
developing
narratives and map
content

2.4.1 Write summaries
and narratives

2.4.2 Write one-page
summaries

2.4.3 Select multimedia

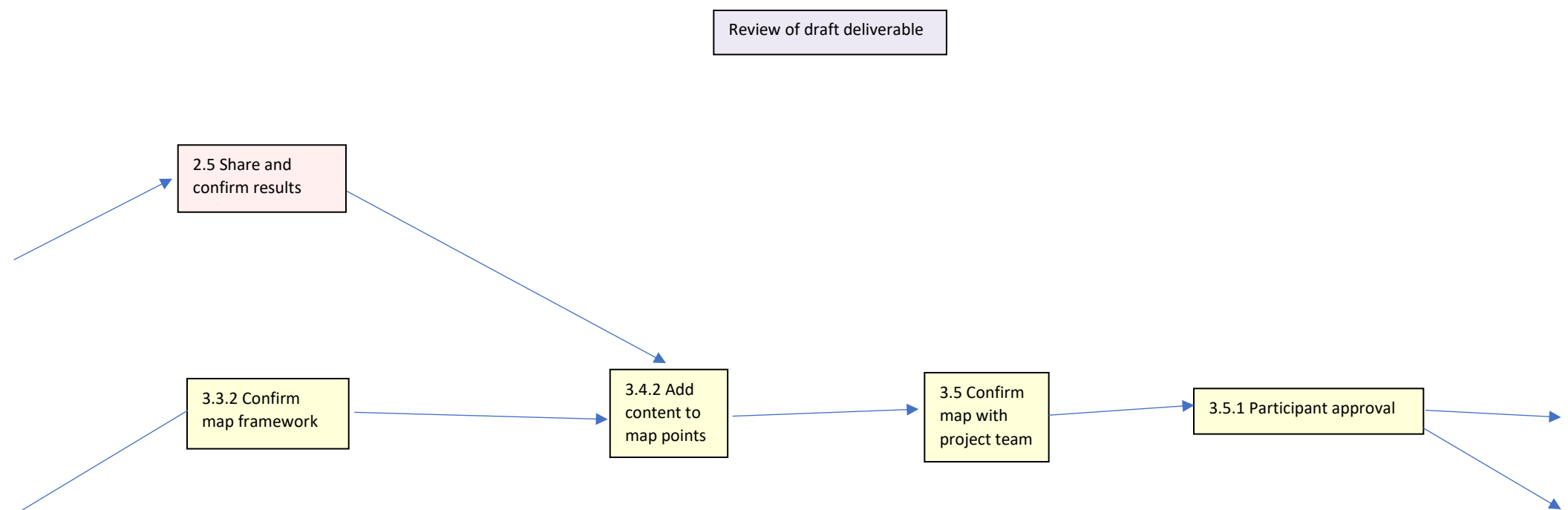
2.4.4 Write summary
report

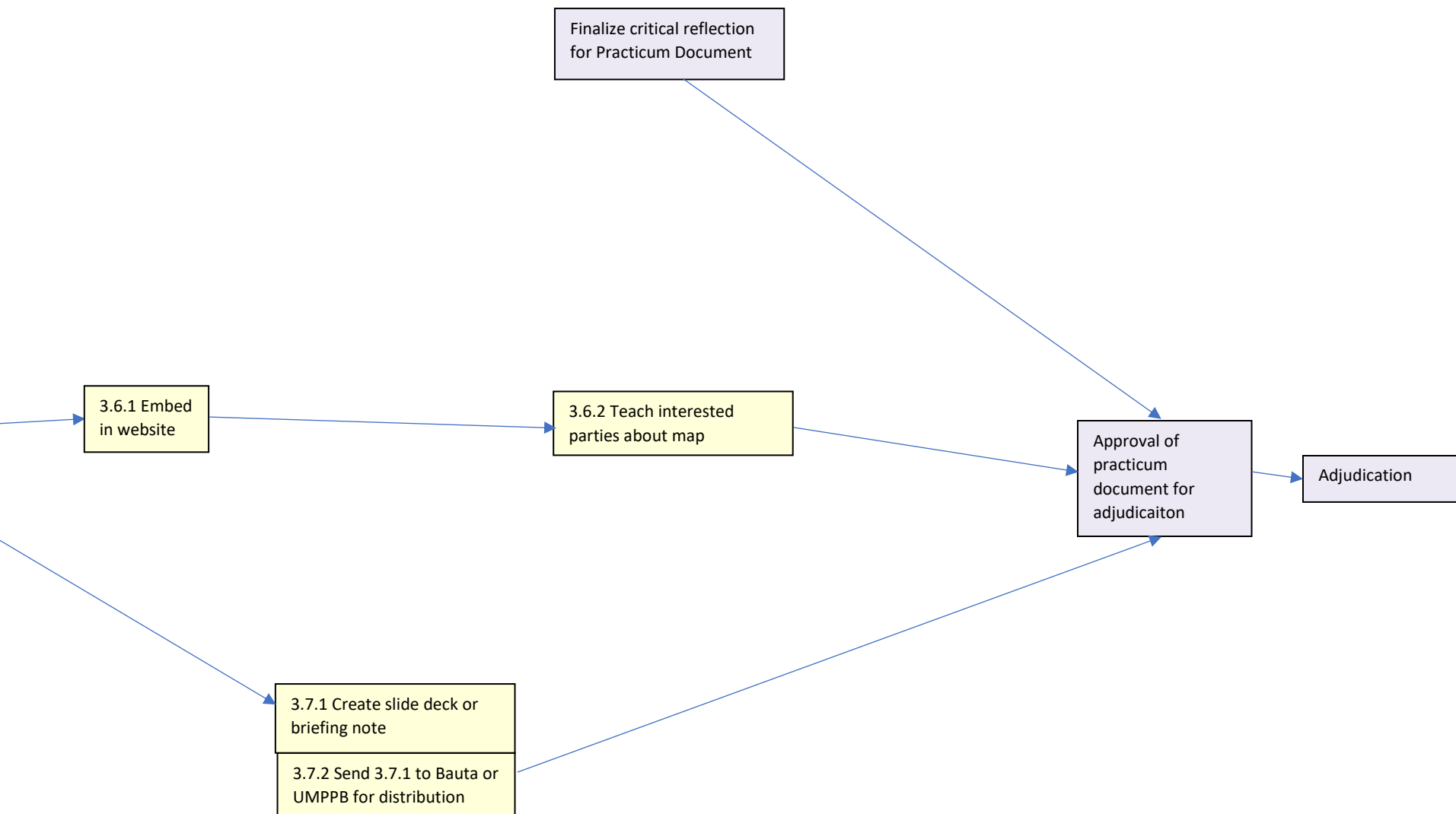
2.4.5 Email developing
reports

3.3 Create map
framework

3.3.1 Email
developing
deliverables

3.4.1 Plot map
points





Critical Path Chart of Activities

The 'critical path' chart of activities calculates the longest path through the project by adding the duration of tasks with no 'float' time – that is, tasks that have no time availability at either the beginning or end that will not affect overall project time if it is to change. Activity titles and descriptions can be found by referred to task number in the Work Breakdown Structure and task list.

Activity/Task #	Dependency	Duration (weeks)	Start Date	Finish Date
Draft Project Plan Meeting	1.3	1	Jan 29	Feb 5
Project Plan Approval	Draft Project Plan Meeting	2	Feb 8	Feb 19
Ethics Approval	2.2.1 Project Plan Approval	3	Feb 22	Mar 12
2.3.1	Ethics Approval	1	Mar 15	Mar 19
2.3.2 + 2.4 (Simultaneous)	2.3.1	12	Mar 22	June 11
2.5	2.4	1	June 14	June 18
3.4.2	3.3.2, 2.5	2	June 21	July 2
3.5	3.4.2	1	July 5	July 9
3.5.1	3.5	2	July 12	July 23
Finalize Critical Reflection	4.7	1	July 26	July 30
Approval of Practicum Document for Adjudication	Critical Reflection, 3.6.2, 4.8	2	Aug 2	Aug 13
Adjudication	Approval of Practicum Document for Adjudication	1	n/a	Aug 20

Interested Parties Register

Name	Role	Responsibilities and contribution	Expectations of project manager	Why do they care?	Implications to Relationship Management
Murray Jowett	Masters student and project manager, Natural Resources Institute	Organize and execute the project plan. Responsible for completion of deliverables. Coordinate interested parties.		I value the contribution of PPB to society and the environment. I would like to graduate before 2028.	
Iain Davidson-Hunt	Advisor, Natural Resources Institute	Guide research and overall project proceedings. Sit on MNRM practicum committee. Sign off on practicum progress document. Sign off on formal FGS documents.	Organized and timely completion of MNRM practicum project steps. Completion of Project Management Coursework. Good communication with project team. Maintain good relations with project team.	This study is related to his work on small-scale food systems and biocultural design. He would like me to graduate before 2028.	
Martin Entz	Director, University of Manitoba Participatory Plant Breeding Program Committee Member	Guide project direction. Act as project resource. Sit on MNRM practicum committee. Sign off on formal FGS documents.	Notification of activities related to project committee. Inclusion in project team communications and updates. Consistent progress.	This research increases the impact of the results of his PPB Program and informs further research.	Martin's program is responsible for the technical execution of the UMPPB program. This study will inform the technical needs of program participants, as desired traits may be directly informed by value chain information.
Aabir Dey	Director, Bauta Family Initiative on Canadian Seed Security Guest Committee Member	Guide project direction. Act as project resource. Connect to Bauta Initiative web developer for hosting of interactive map. Connect to web developer for nesting map in website. Sit on MNRM practicum committee.	Adherence to agreements outlined in project plan documents. Regular and succinct check-ins and updates on progress. Regular opportunities for giving feedback. Respectful relations with PPB and study participants and adherence to university ethics guidelines. Consistent progress.	His program has an interest in scaling up PPB and increasing the commercial opportunities of PPB and contributing to short/local value chains.	The Bauta Initiative Is the outward facing element of the UMPPB project. It is in their interests that farmer participants have a positive experience with PPB. Likewise, their intention to make PPB a more common practice depends on effective communication of its benefits and successes. Bauta will need to engage in effective outreach to draw in participants that would either not be aware of PPB or be on the fence about participation.

Iris Vaisman	Grain Program Manager, Organic Alberta. Prairies coordinator for Bauta Family Initiative. Guest Committee Member	Guide project direction. Act as project resource. Connect to Case study candidates.	Adherence to agreements outlined in project plan documents. Regular and succinct check-ins and updates on progress. Regular opportunities for giving feedback. Respectful relations with PPB and study participants and adherence to university ethics guidelines. Consistent progress.	Their program has an interest in scaling up PPB and increasing the commercial opportunities of PPB and contributing to short/local value chains.	Same as above.
Helen Jensen	National Research Program Manager, Bauta Family Initiative on Canadian Seed Security Project partner representative for practicum progress and FGS signatures	Guide project direction. Act as project resource. Connect to case study candidates. Sign off on practicum progress document. -Sign off on formal FGS documents.	Adherence to agreements outlined in project plan documents. Regular and succinct check-ins and updates on progress. Regular opportunities for giving feedback. Respectful relations with PPB and study participants and adherence to university ethics guidelines. Consistent progress.	Their program has an interest in scaling up PPB and increasing the commercial opportunities of PPB and contributing to short/local value chains.	Same as above. Helen is particularly involved in on-the-ground project implementation. She may have the closest relationships with participant farmers and have the most thorough understanding of their interests. It is important to follow Helen's cues re: relationship management with farmers.
Case study PPB farmers	Farmer participants in PPB program. First step in value chain discovery.	Participate in interviews and possibly accommodate researcher's participant observation of activities. Provide initial link to further value chain actors. Participate in resulting outreach activities.	Adherence to university ethics guidelines. Gives opportunity to review and give feedback for study results. Respect for their time and knowledge. Production of relevant and useful data/deliverables.	Sharing and receiving knowledge about PPB value chain development practices may increase their ability to create value from PPB participation. They may want to contribute because they believe in the social/ecological benefits of PPB and want to aid in its success.	They are busy and likely over-studied. They are also contributing time and knowledge that needs to be honoured. It is important to not overtax them with communication and make too many demands, yet at the same time they must see the fruits of their contribution and hopefully participate in review of project results.
Case study value chain participants	Processors, distributors, retailers of PPB	Participate in interviews and possibly accommodate	Adherence to university ethics guidelines.	Sharing and receiving knowledge about PPB value chain development	Same as above.

Including consumers/users of PPB seed with their own value chains)	products including seed.	researcher's participant observation of activities. Help connect to other value chain actors. Participate in resulting outreach activities.	Gives opportunity to review and give feedback for study results. Respect for their time and knowledge. Production of relevant and useful data/deliverables.	practices may increase their ability to create value from PPB participation. They may want to contribute because they believe in the social/ecological benefits of PPB and want to aid in its success.
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Assumptions and Constraints

Assumptions

1. Interviews will be carried out remotely either through virtual meeting or phone call.
2. Once the project is complete, responsibility for upkeep and updating of the map and further outreach is the responsibility of the Bauta Initiative.

Constraints

1. Timeframe: 6 months
2. Covid-19 Travel Restrictions: This has already been accommodated and interviews will be conducted remotely. Covid 19 does not present a significant constraint because travel is no longer required.
3. Farmer/Informant availability: The interview schedule will be highly dependent on participant availability. The allotted months should allow for agreeable dates for interviews to be found, given proactive contact and scheduling.

Responsibility Assignment Matrix (RACI)

ID:	Activity	Murray (Assigned 'A' unless otherwise stated)	Iain	Martin	Heleen	Aabir	Iris	Maria
1.2.1	Create Frame/Outline	R						
1.2.2	Write content and reference list	R						
1.3	Vet with Iain Davidson-Hunt	R	C					
1.4	Send to project team	R						
2.1.1	Set parameters for case studies	R	C	C	C	C	C	
2.1.2	Discuss current knowledge of value chains and potential cases with project team	R		I	I	I	I	
2.1.3	Determine workload/time-demands of each case study	R	C	C	C	C	C	
2.1.3.1	Preliminary investigations and contact with potential case studies	R		II	II	II	II	
2.1.4	Decide which cases and how many can be accomplished in four-month timeframe (overall 8 months)	R	C	C	C	C	C	
2.2	Create interview format	R	I/C	I/C	I/C	I/C	I/C	
2.2.1	Send interview format and questions for review and confirmation	R	R	R	R	R	R	
2.3.1.1	Send interview requests	R						
2.3.1.2	Schedule interviews	R						
2.3.1.3	Send interview prep	R						
2.3.2	Collect Data: Interviews, journal, photographs, video	R	C	C	C	C	C	
2.3.3	Begin developing narratives and map content	R	C					
2.4.1	Write summaries and narratives	R	C					

2.4.2	Write one-page summaries	R	C					
2.4.3	Select Photographs and multimedia	R	C					
2.4.4	Write Summary report	R	C					
2.5	Share and confirm results with project team			R/I	R/I	R/I	R/I	
3.1	Ask Aabir for contact with web developer	R				I		
3.1.2	Communicate with Bauta web developer	R						R?
3.2.1	Meet with Maria re: map creation	R	C					I
3.2.2.1	Source GIS software	R						C
3.2.2.2	Review similar maps and GIS tutorials	R						C
3.2.3	Ask Maria to create map (or create independently)	R	C					C
3.3	Create map framework	R	C	C	C	C	C	R?
3.3.1	Email developing deliverables to project team for review	R		I	I	I	I	
3.3.2	Confirm map framework	R		I	I	I	I	
3.4.1	Plot map points	R						R/I
3.4.2	Add case narratives and multimedia to map points	R	C					R?
3.5	Confirm map with project team	R	C	C	C	C	C	
3.5.1	Send final deliverables to case study farmers and participants for approval	R						
3.6.1	Embed in Website					R		I
3.6.2	Teach interested parties about map	R?			C	C	C	R?
3.7.1	Create slide deck or briefing note	R						
3.7.2	Send 3.7.1 to Bauta or UMPPB for distribution	R						

*R = Responsible, A = Accountable, C = Consult, I = Inform

Skills Inventory

Person	Job Title	Skills/training	Years	Education
Maria Lira Ledesma	PhD Candidate	GIS	5 apprx	Course
Ben Horne	MNRM candidate	GIS and Graphic Design	8 apprx	Course/teacher
Murray	Project Manager	Qualitative Methods	.5	Course

Materials, Supplies & Equipment

Task	Materials Needed	Quantity	Available/Procure	Approximate Cost
Data/multimedia collection	Rent vehicle for case study visits.	1	Likely available (NRI). Possible rental.	\$150
	Camera/Videocamera	1	Likely available (NRI). Possible rental.	\$150
Create Map Framework	Design/GIS program	1	Available through university	\$250
Embed in Bauta Website	Webpace	n/a	Available	nil

Probability and Impact Matrix

Risk #	Risk	Probability	Impact	Score (Probability x Impact)
1	Recruitment: Low interest or unwillingness to participate from case study farmers.	.3	.6	.18
2	Recruitment: Low interest or unwillingness to participate from value chain participants	.5	.5	.25
3	Finding out about value chains that contravene regulations	.8	.4	.32

4	Accidentally disclosing sensitive information about farmers and value chain participants	.4	.8	.32
5	Results are found to threaten farmers or value chain participants with penalties	.2	.3	.06
6	Exposing case study participants to COVID-19 or contracting COVID-19	.2	.1	.02
7	Project goes beyond August adjudication date	.4	.7	.28
8	Maria is delayed on map creation	.2	.5	.1
9	Deliverables not acceptable to committee and project team	.2	.5	.1
10	Deliverables not acceptable to study participants	.2	.5	.1

Risk Register

Risk #	Risk Name	Response Plan Created?	Response Plan Location	Risk Owner	Status
1	Finding out about value chains that contravene regulations	Y	Project Charter	Murray	Pending
2	Accidentally disclosing sensitive information about farmers and value chain participants	Y	Relationship Management Plan	Murray	Pending
3	Project goes beyond August adjudication date	Y	Charter Timeline, Work Breakdown Structure	Murray	Pending
4	Recruitment: Low interest or unwillingness to participate from value chain participants	Y	Risk Responses	Murray	Pending
5	Webinar timing does not work for participant presenters (Must be before August but after study and map is complete)	Y	Relationship Management Plan, Risk Responses	Murray	Pending

6	Recruitment: Low interest or unwillingness to participate from case study farmers.	N	Pending	Bauta Initiative	Pending
7	Maria is delayed on map creation	N	Pending	Maria	Pending
8	Deliverables not acceptable to committee and project team	Y	Quality Management Plan	Murray	Pending
9	Deliverables not acceptable to study participants	Y	Relationship Management Plan	Murray	Pending
10	Results are found to threaten farmers or value chain participants with penalties	Y	Risk responses	Murray	Pending
11	Exposing case study participants to COVID-19 or contracting COVID-19	Y	Scope Statement	Murray	Pending

Work Breakdown Structure (WBS)

The Work Breakdown Structure (WBS) is derived from the deliverables, providing a hierarchic breakdown of the activities and sub-activities needed to produce the deliverable. The individual numbered activities of the WBS are collected in the Activity List (next section), which allows for timing estimates and tracking of activity progress. This list enables the sequencing and timing in subsequent sections and appendices such as the Milestone Chart, Critical Path Chart, and Project Schedule.

Several documents inform the construction of the Work Breakdown Structure. The WBS draws primarily on the deliverables of the Project Charter to identify the main tasks of project delivery. The Scope Statement is another main source used to determine which activities do or do not fall within the work of this project.

Also informing the WBS are the 'Resource Requirements and Procurement' and 'Skills and Knowledge Acquisition' sections of the Project Plan. The items detailed in these sections generate activities to be added to the WBS because work is needed to acquire and procure them. These sections come after the WBS in the Project Plan. Activities are also generated by the steps taken in the Risk Management Plan, Quality Management Plan, and Communications Plan and these have been included in the WBS.

3. PPB and value chain critical issues identification report

3.5 Research (Largely complete already)

1.2 Write

1.2.1 Create Frame/Outline

1.2.2 Write content and reference list

1.3 Vet with Iain Davidson-Hunt

1.4 Send to project team

3. Value Chain Discovery

2.1 Determine Case Studies

2.1.1 Set parameters for depth and breadth of case study

2.1.2 Discuss current knowledge of value chains and potential cases with project team

2.1.3 Determine workload/time-demands of individual case studies

2.1.3.1 Preliminary investigations and contact with potential case studies

2.1.4 Decide which cases and how many can be accomplished in 4 month timeframe (overall 7 months)

2.2 Create interview format using scope statement, charter, example questions from Iain Storosko and project plan to set parameters of questions.

2.2.1 Send interview format and questions for review and confirmation

2.3 Collect data

2.3.1 Set up interviews: This is an iterative process which is repeated as value chain actors are discovered through interviews.

2.3.1.1 Send interview requests including project description and endorsement from Bauta.

2.3.1.2 Schedule interview.

2.3.1.3 Send interview prep including questions and the type of information we are seeking.

2.3.2 Carry out virtual interviews, journal, request multimedia from participants

2.3.3 Begin developing ideas for narratives and map content

2.4 Organize and Write Results

2.4.1 Write summaries and narratives of farmers and individual value chain actors

2.4.2 Write one-page summaries of each case study value chain

2.4.3 Select Photographs and multimedia to include in individual and summary reports (if the 'farmer profile' approach is taken)

2.4.4 Write Summary report of entire value chain discovery including composite value chains

2.4.5 Email developing reports/narratives to project team, case study farmers and value chain participants for feedback to make sure information is accurate, safe, and meets requirements.

2.5 Share and confirm results with project team.

3. Interactive Map

3.1 Contact Aabir regarding hosting map on website and possible contact with web developer

Ascertain the process for transfer of map

3.1.2 Communicate with Bauta web developer to learn requirements or needs for hosting map on website

3.2 Investigate GIS and map creation options (who, what, can I learn how to do it?) to decide if I will be able to make the map or if I will have to ask someone to do it for me.

3.2.1 Meet with Maria to discuss map creation and ascertain how the map will be created, what resources are needed to do so, and a possible timeline for completion

- 3.2.2 Investigate basic GIS / get acquainted to get some exposure to software and skill set
 - 3.2.2.1 Source GIS software
 - 3.2.2.2 Review similar maps and GIS tutorials
- 3.2.3 Ask Maria to create map or decide to create map independently
- 3.3 Create Map Framework
 - 3.3.1 Email deliverables to project team for review as they progress to make sure requirements and quality standards are met
 - 3.3.2 Confirm map framework
- 3.4 Populate map
 - 3.4.1 Plot map points
 - 3.4.2 Add case narratives and multimedia to map points
- 3.5 Confirm map with project team
 - 3.5.1 Send final deliverables to case study farmers and participants for approval
- 3.6 Deploy Map
 - 3.6.1 Embed in website
 - 3.6.2 Teach interested parties about map interface and upkeep (if they wish to augment and update it.)
- 3.7 Distribute to PPB program participants via Bauta and UMPPB online networks
 - 3.7.1 Create slide deck or briefing note including charts, tables – the output of the project.
 - 3.7.2 Send to Bauta and UMPPB for distribution either in their newsletter or through separate communication.

Activity List

This is a living document, developed from the Work Breakdown Structure. Keeping track of activity initiation and duration can help to make sure the project is on track. The Activity List informs the Critical Path, Milestone Chart, and Schedule.

WBS #	Deliverable	Activity	Comments	Duration Estimate	Activity Initiated	Date Completed	Actual Duration
1.1	1 PPB and value chain critical issues identification report	Research	Completed before project initiation		Aug 2020		6 month
1.2.1		Create Frame/Outline		2 days	Oct. 5	Nov. 7	1 month
1.2.2		Write content and reference list		3 days	Nov.2	Jan 15, 2021	2.5 month
1.3		Vet with Iain Davidson-Hunt		3 days	Jan 15	Feb. 8	3 week
1.4		Send to project team	To be submitted in project plan	1 email		Feb. 23	6 month
2.1.1	2. Value Chain Discovery	Set parameters for case studies		1 day	Mar 1	Mar 1	1 day
2.1.2		Discuss current knowledge of value chains and potential cases with project team		1 meeting	Mar 1		Consistent
2.1.3		Determine workload/time-demands of each case study		1 meeting	Mar 1		Consistent
2.1.3.1		Preliminary investigations and contact with potential case studies		2 weeks	Mar 5	Mar 19	2 week
2.1.4		Decide on cases		1 meeting		Jun 7	
2.2		Create interview format	Changed after initial interviews	3 days	Apr 1	May 11	1.5 month
2.2.1		Send interview format and questions for review and confirmation		2 days	Apr 12	Apr 19	1 week
2.3.1.1		Send interview requests		1 day		Apr 7	1 day
2.3.1.2		Schedule interviews		1 day	Apr 9		consistent
2.3.1.3		Send interview prep		1 day	Apr 19		consistent
2.3.2		Collect Data: Interviews, journal, photographs, video		4 months	Apr 22	Jan 6 (2022)	9 month
2.3.3		Begin developing summaries, narratives and map content		4 months	Aug 5		consistent

2.4.1		Write summaries and narratives	2 months	Aug 5	May 14 (2022)	9 month
2.4.2		Write one-page summaries	2 months	Aug 5	May 14, 2022	9 month
2.4.3		Select Photographs and multimedia	2 months			
2.4.4		Write Summary report	2 months	May 10	Oct 17	5 month
2.4.5		Email reports/narratives as they develop	1 day			
2.5		Share and confirm results with project team	2 weeks	Dec. 22, 2022	Jan. 16, 2023	3 week
3.1	3. Interactive Map	Ask Aabir for contact with web developer	1 day	Removed		
3.1.2		Communicate with Bauta web developer	1 meeting			
3.2.1		Meet with Maria re: map creation	1 week			
3.2.2.1		Source GIS software	1 week			
3.2.2.2		Review similar maps and GIS tutorials	1 week			
(3.2.3)		Ask Maria to create map (or create map independently)	1 meeting			
3.3		Create map framework	2 months			
3.3.1		Email developing deliverables to project team for review	1 day			
3.3.2		Confirm map framework	3 days			
3.4.1		Plot map points	1 week			
3.4.2		Add case narratives and multimedia to map points	2 weeks			
3.5		Confirm map with project team	1 week			
3.5.1		Send final deliverables to case study farmers and participants for approval	1 email			
3.6.1		Embed in Website	1 week			
3.6.2		Teach interested parties about map	1 meeting			
3.7.1		Create slide deck or briefing note	1 week			
3.7.2		Send 3.7.1 to Bauta or UMPPB for distribution				

Milestone Chart

Milestones are significant points in the project that wrap up groups of activities and indicate progress. This milestone chart is used to report on project progress and milestones are also tracked in the project schedule.

ID:	Milestone	Expected Completion Date	Actual Completion Date	Comments
Practicum, Stage 1	Draft project plan meeting	Feb 5	Feb 8	
Practicum, Stage 1	Project plan approved	Feb 19	Feb 23, 2021	
Practicum, Stage 1	Ethics Approved	March 12	Apr 5, 2021	
2.3.2	Data Collected (Ideal)	May 28	Jan 6, 2022	
2.5	Narratives and Summary Report Complete and Confirmed	June 18	Jan 16, 2023	
3.5.1	Map filled with content and confirmed	July 23		Removed
Practicum, Stage 4	Approval of practicum document for adjudication	Aug 13	Jan 16, 2023	
Practicum, Stage 5	Adjudication	Aug 20	March 3, 2023	

Meeting Log

Sept. 16, 2020 – Iain Davidson-Hunt, Martin Entz, Murray Jowett

Discussed practicum and project options, confirmed interest in connecting with representatives from Bauta Initiative.

Oct. 9, 2020 – Iain Davidson-Hunt, Aabir Dey, Martin Entz, Murray Jowett, Iris Vaisman

Discussed research interests and needs for Bauta Initiative, as well as Murray and Iain's research interests. Interests aligned on short value chains and market development of PPB products. Discussed project options, primarily the idea of an interactive narrative/multimedia value chain map. Helen Jensen was looped in after this meeting as a potential project partner and meeting was considered for early November.

Nov. 9, 2020 – Iain Davidson-Hunt, Aabir Dey, Helen Jensen, Murray Jowett, Iris Vaisman

This meeting provided more background, scoping, and specifications for the project. We discussed the project charter including key success factors and alterations to deliverables and requirements. One deliverable was added which is the production of one-page summaries accompanying each value chain. Main additions to requirements were the inclusion of a PPB corn cooperative in Quebec as a case, the specific need to investigate potato value chains, inclusion of incomplete value chains, and the consideration of enabling factors and barriers in value chain development. Of note, the idea to include 'composite' value chain descriptions was discussed. These composite chains can depict trends, patterns and a diversity of value chain models without putting participant farmers at risk if some of their value chains are still informal. The need to protect farmers and the Bauta Initiative from this risk has been noted and will be included in the upcoming risk analysis.

Other aspects of scope were discussed and revised in the charter including the specification to include an explicit statement of qualitative investigation, specification that case studies will draw on the UMPPB program, specification that narrative production includes all value chain participants along with farmers, and specification of how narrative and multimedia information is displayed and accessed on the map. Considerations of project "must have's" or critical acceptance criteria were minimal. Helen specified that a lot of this information is known, but that it is useful to marshal it in one place in a sharable, visual format. Aabir specified the importance of representing a diversity of cases. This includes geographic and crop diversity but also diversity among types of value chains and market orientations.

Helen agreed to be the official project partner while Iris and Aabir will continue on as guest committee members.

Feb. 8, 2021 – Draft Project Plan Meeting – Iain, Helen, Murray

The webinar will take a different form (to be worked out later) and not require such extensive outreach as planned. It will likely take the form of a “project update”, briefing, or short slide deck that could be sent in the newsletter or dispersed through Bauta/UMPPB networks. This means not too wordy, a brief summary, focus on the output, charts, tables. Murray is willing to re-enter post-adjudication for a presentation that is more in line with Bauta and Farmer’s schedules. (Ex: November meeting and presentation of farm club.) This will allow more time for interview and report/narrative/map development and for Murray to have adjudication in August.

Outreach will need to start asap as it takes some time to get a hold of farmers and work with their various schedules. Helen suggested changing scope from 15 to ‘10-15’ interviews. Helen and Murray are contacting a few people to start getting an idea of the extent of translation needs and cost. (Both written translation and interview translation). There is a possibility this can be done in-house.

Murray will develop a presentation and roadmap of the project plan. A lot of this is situating the project in the overall research, explaining how the research question was arrived at. This will bridge the social science and more agronomic aspects of the program and delve more into methods and validity.

We were trying to further understand the requirements of anonymity and how this works with project progress and outcomes. We will likely be developing a more ‘abstracted’ map – that is referencing larger generalized areas, not using specific locations, and anonymizing bakers, farmers etc. One option is to feature farmers on the map with the *earlier* parts of their work that are completely above board. There is no indication farmers will be particularly worried about anonymity but they must be fully informed and consenting, and have the option of participating anonymously.

Feb. 23, 2021 - Project Approval Meeting - Iain, Helen, Murray, Martin, Aabir

Project plan was approved after a brief presentation by Murray and Iain. It was agreed that farmers levels of comfort with confidentiality re: possible regulatory complications will be assessed. Learning of farmers varying levels of comfort in this way allows us to alter deliverables accordingly (to accommodate more or less privacy) and to include this information in the reports on PPB value chains.

Value chain discovery will leave out possible value chains built on PPB seed, firstly because there are not likely to be any seed value chains, and second because this is the main area where regulatory hurdles exist. The discovery will therefore focus on PPB

grain/commodity chains. Complications may exist for potato chains, both because potato disease containment regulations are more stringent and because parent material is derived from UMPPB as well as AAFC, creating possible intellectual property issues. It can also be noted that the necessity of looking at corn value chains has been reassessed and can be seen as more of an optional step if time permits. This is because there are very few PPB corn producers, and time can be saved by not learning value chains for a fourth commodity.

Helen is seeking an extension of her farmer honoraria OFRF budget from April 15 to August to ease time restrictions. Murray will be developing a case study guide for circulation based on IDH's Biocultural Design work. IDH will be pursuing an amendment to his current ethics program that will accommodate the PPB Value Chain project. Iain will circulate approval forms. Finally, the team was flexible and agreed that it would be ok for changes to the project plan to be entered in the change log and then emailed, as opposed to using a more involved google doc or track changes in Microsoft Word.

June 7, 2021 - Deliverables Outline Meeting

This was an official practicum process meeting going over general progress and checking in about the various deliverables and their feasibility/applicability at this point in the project. I was concerned that the lack of value chain development would present an issue for producing the interactive map, and so was interested in talking about a potential pivot to a new deliverable.

I updated on general progress, which at this point was at 7 official interviews and 2 unofficial interviews with a baker and a farmer. Still transcribing, starting to draft summaries and draw value chains.

We decided I can still do a map based more on PPB participants perspectives on value chain development. For example, I may include 'where they see it going' and obstacles. If it seems useful to talk to Value Chain people (even prospective ones) then I'll do it. In this way I could map out the *potential* of value chains as well. Can also run general results from conversations with prospective bakers/millers past other bakers/millers/farmers and ask if they share this experience.

It is also OK if the map is not interactive, in other words, not a super connected depiction of value chains etc, but more just putting the farmers on the map and then explaining their story and perspectives on value chains. Helen also expressed interest in patterns, and is wondering what kind of analysis can be done to present patterns in a useful way.

Helen: Is there a way, some kind of analysis that can be done, a way to present.

- What do the patterns that are coming out look like?
 - Any characteristics/variables
 - Any basic patterns emergent from current people's patterns?

Should mention in my reports that nobody is looking to register and sell as seed. Some looking to register and sell as crop, but not as certified seed.

Should have one line saying VC for producing certified seed was not present

Generally people don't shift VC to incorporate PPB

- Under what circumstances do they shift things?
 - Ex: shift to direct market
 - May derive value from the direct, the sense of place
- Draw/map this out, want to be able to visualize the structure of value chains both PPB and non.
- Probably doesn't have to be an "interactive" map - maybe just something where you see the case studies.
 - Just a story, opens up some photos

May 11, 2022 - Draft Deliverables Meeting + Annual Progress Report - Aabir, Iain, Murray

Summary document, diagrams, farmer one-pagers:

- Important to avoid conflation of terminology, ex: seed and grain.
- Small systems diagram could be be circular. Don't need to do this, but could mention it.
- Will send completed one-pagers to Aabir and to participant farmers for revision.

Interactive Map:

- Agreed that Murray will do a more 'bare-bones' map, as it will be processed and tweaked by Bauta regardless, and possibly used in concert with other BFICSS map ideas.
- The content is the important part, so this can be considered a 'pilot' of sorts
- Murray will have the option to send map content in another format such as a Word document
- Aabir is interested in whatever would give a snapshot of the grower, their interest in the program, where you can find their information. Capturing the "vibe" of the producer.
- Can also include information akin to Iain Storosko's research re: breeding preferences and the farmer's imprint on the genetics they were working on.
- Murray will not ask farmers to send media and links

Aabir had questions about the timing and needs for review of deliverables as they are finalized, partially because there may be some funny timing between Helen's planned return at the end of May (?) and his parenting leave starting in July. Murray will send deliverables for review as they develop so that review can be completed early in segments and not as one big package. Hopefully this makes the transition from Helen to Aabir more smooth.

Aabir is satisfied with the drafts and so will sign and send the Annual Progress Report and the Practicum Progression form.

Murray will send one-pagers and map content to Aabir in Word documents, as well as sending one-pagers to farmer participants for review.

Jan 16, 2023 - Approval of Practicum Document for Adjudication - Aabir, Martin, Iain, Murray

Practicum document confirmed for adjudication with minor edits and Adjudication date set for March 3, 2023.

Comments mainly referred to large and small systems diagrams looking for clarification of components.

Change Log

March 1, 2021:

Google doc links added to active/tracking documents (Change Log, Meeting Log, Milestone Chart, Activity List) in appendices.

Requirement to study seed value chains removed from deliverables and requirements and added to Scope exclusions.

All project elements relating to Objective 4 “Connect and share knowledge between farmers and value chain actors who are practicing or interested in PPB,” have been removed and added to exclusions. Deliverable 4, “Webinar to share study results with participant farmers in fall 2021.” has been removed. Note that participation in a webinar after project completion is still encouraged and intended, but it is now out of the official project scope. Objective 4 has been removed from executive summary, deliverables, requirements, and quality management.

Requirement 2 (in Charter), bullet point “case selection criteria”, sub-point 2 changed to read: “Represent each UMPPB commodity (potato, oats, wheat, and corn) prioritizing grain, then potato, and then corn if time permits.” Grain value chains have been prioritized due to complications from potatoes and the limited number of corn participants.

March 23, 2021:

It turns out ethics will not allow giving honoraria to only the farmers. Iain offered in an email today to cover the honoraria beyond Helen’s OFRF budget.

April 27, 2021:

We’ve added Christopher Kelly-Bisson and Laurence Ammann-Lanthier to the project team and will have both sign an oath of confidentiality. Christopher is an analyst with Bauta and will be sitting in on some interviews and possibly informing questions related to plant intellectual property and variety registration. Laurence is a student of Iain’s who has been hired to help with interview translation with the French farmers.

Early email responses, phone communication and interview indicate that we should be prepared to pivot and adapt questions for a lack of value chain development. The interview format, informed consent form and recruitment email have all been adapted to accommodate those who have not developed value chains.

Jan 4, 2022:

The project fell very much behind schedule in the summer and fall. I have made progress on deliverables such as one-page summaries, participant narratives and content for the overall report, but they remain incomplete. The new completion deadline is March 4, 2022, aiming to hold the adjudication before April 2022.

Farmer participants have also been updated about project progress.

Jan 31, 2022:

This week I will clarify the timing of the various stages of the project and adjudication. This includes the amount of time that Iain, Helen, and the committee will need to review submissions. I estimate being two weeks behind schedule. Still, I think the time set aside for the map has been overestimated, so if writing concludes over the next month it won't delay things substantially.

May 13, 2022

At the draft deliverables meeting we decided the interactive map could be more of a bare-bones test or pilot because BFICSS would have to tweak it anyway and may consider merging this information with other maps. I will still share the biographic and writeup content with the BFICSS but not include it in the deliverables or practicum document. I will also not share this content with farmers, and will tell them it will not be made public unless BFICSS decides to ask them. I will also not be asking for farmers to share media and links.

December 12, 2022

Iain and I looked over the project to make some decisions about the format of the final document and get it ready for review by the committee at the 'Approval for Adjudication' meeting. We decided that the detailed farmer case reports (different than the case study summaries contained in the summary document) would be included as deliverable three in the practicum document and that the background report

January 25, 2023

Updated IPP to reflect current/most recent iteration of the project, with changes to project charter that reflect changes discussed by the project team from discussions and meetings:

Updated active documents in IPP to their most current state, as hyperlinks to online documents would not be accessible after some time. This way the Practicum Document can exist as a standalone document, not attached to online resources that may be removed over time.

- Wrote 'aspirational schedule' under "project schedule" in charter.
- Budget updated to final figure (\$11297.21)

Appendices remain largely as they were - historical documents that did not require updates because they were used to build the charter and IPP. There are four at the end - Activity List, Milestone Chart, Meeting Log, and Change Log that have been updated and included in their final form.

- Activity list updated with activity initiation and completion dates. Link removed from activity list.
- Milestone chart updated with completion dates. Link removed.
- Meeting log updated from live document. Link to live document removed.
- Change log inserted into document. Link removed.

Ethics Approved Participant Recruitment E-mail

Dear _____,

I am Murray Jowett and I am a masters student at the Natural Resources Institute of the University of Manitoba. I am undertaking a practicum project, as part of a multi-year project funded by the Social Sciences and Humanities Research Council of Canada, which aims to better understand existing processes of innovation within the small-scale food sector (also known as craft or artisanal products). The University of Manitoba Participatory Plant Breeding Program (UMPPB) is an innovation of interest, and the creation of value chains from UMPPB products is the subject of this study. I hope the results of this study will help the UMPPB program make PPB more useful and appealing to farmers and inform government policy and programmes to improve support for PPB innovation.

As a UMPPB participant, I would like to develop a case study with you. The case studies I am developing will be used to create an interactive online map for the Bauta Family Initiative on Canadian Seed Security displaying the structure and connections of PPB value chains. Ideally it will also include biographical and narrative information about your enterprise and the other enterprises on the value chain which, if you and other participants of your value chain consent, will serve to educate the public about PPB value chains. If you have not marketed your PPB population, I would like to discuss barriers and other influences that inhibit value chain development. Additionally, the information gathered from these case studies will generate reports that increase our understanding of the structure and development of PPB value chains. The option of anonymizing your participation is available.

To develop the case study, we will undertake virtual/phone interviews regarding your experiences with PPB and the development of PPB value chains. Interviews will take place between late March and mid-June at a time of your choosing. These interviews should take approximately 60-90 minutes to complete and questions will be provided to you if you would like to jot down your thoughts prior to the interview. Interviews will be audio recorded and transcribed, if permitted by you. I would also be grateful if you could provide multimedia such as photo, video and web links to complete your bio/profile/narrative on the interactive map. Your participation in this project is voluntary, although we will offer a \$200 honorarium in respect of the time you volunteer to the research. You will only be expected to participate in ways with which you are comfortable. You are also able to withdraw from this research at any time.

Please let me know by responding to this email if you would like to participate and if you would like any further clarification via a phone conversation to decide upon your participation.

Sincerely,
Murray Jowett, BA, MNRM candidate
Natural Resources Institute,
Clayton H. Riddell Faculty of Environment, Earth and Resources,
University of Manitoba
Phone: xxx-xxx-xxxx
Email: xxxxxxx@xxxxxxxxxxx.ca

Ethics Approved Informed Consent Form For Research Participants



Natural Resources Institute

70 Dysart Rd, Winnipeg, Manitoba Canada, R3T
2N2 Tel: (204) 474-7170 Fax: (204) 261-0038
http://www.umanitoba.ca/academic/institutes/natural_resources

Research Project Title: Value Chain Discovery of Canadian Participatory Plant Breeders

Funder: Social Science and Humanities Research Council (SSHRC)

Research Team: Murray Jowett (primary), Iain Davidson-Hunt, Helen Jensen, Aabir Dey, Iris Vaismann, Martin Entz, Christopher Kelly-Bisson, Laurence Ammann-Lanthier

Contact: Murray Jowett, xxxxxx@xxxxxxxxxxx.ca, xxx-xxx-xxxx (landline)

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

Summary: My name is Murray Jowett and I am inviting you to participate in a research project to better understand processes of innovation within Participatory Plant Breeding (PPB) value chains and markets.

As a representative of a small-scale food sector enterprise who has created innovative products, I would like to develop with you a case study of your enterprise generally relating to your participation (or lack of participation) in PPB value chains with a specific focus on your interaction with short food chains. These case studies will be used to create an interactive online map displaying PPB value chains and profiling their participants. Case studies will also be used to generate reports that will increase the overall understanding of PPB value chains and help other PPB farmers develop value chains for their populations. Interviews will include the following topics:

- a. Personal story/history (used to create narratives for the interactive map and develop an overview.)
- b. Enterprise/organization background (for narratives and overview)
- c. Description of PPB product and value chains (including history with and process of becoming involved in PPB, shape of value chain, and experience with value chain development)
- d. Values that inform/underpin producers/partners motivation for participation
- e. Factors that enable and hinder value chain development
- f. Perspectives on the potential for and best practices of PPB value chain development
- g. Perspectives on important PPB value chain information to gather and the helpful/appropriate uses for this information.

Procedures:

Due to concerns with COVID-19 and current university policy, the interview to develop your case study is to be conducted remotely online or via phone call. Interviews will take place at a time of your choosing. Interviews should take approximately 60-90 minutes to complete. Interviews will be audio recorded and transcribed, if permitted by the interviewee.

Participants are free to ask questions at any time regarding the procedures and goals of the study, and their participation in interviews.

Data Storage: Hard copies of interview data will remain under the strict supervision of the researcher: in a locked filing cabinet at his home. Zoom recordings will be downloaded from a Canadian zoom cloud server onto the researchers local hard drive upon completion of the interview. This and other electronic data will be stored in encrypted form in a password-secured computer. Data will only be accessible to the researchers named at the beginning of this consent form. Your contact information will be kept in an encrypted file in the primary researcher's password-secured personal computer and destroyed upon completion of the study.

Potential Risks: Others may be made aware of your innovation and utilize it in their own businesses. Any proprietary information that is not yet public should not be revealed as part of this project. Additionally, there may be risks relating to varietal propriety and the selling and saving of PPB seed. Though I do not believe these risks to be significant, I assume you are aware of your own relationship with government and agricultural regulations and encourage you to participate and volunteer information to the degree with which you are comfortable. My hope is that your information can be made public to demonstrate viable examples of PPB value chain development. If you have any concerns, please discuss with me prior to your participation.

Benefits: I hope the collection of case studies assembled by this project will provide useful insights to all who participate. By participating in this research, you will be increasing the overall understanding of PPB value chains, thus allowing for the consideration of market/value chain factors in further PPB project development. There is great potential for PPB and your participation brings us closer to actualizing it. Additionally, if you choose to have your enterprise featured in the interactive online map, I hope you will see this as an opportunity to make people aware of your interesting and innovative work and increase the online presence of your business.

Dissemination: The data collected through this research will be compiled into reports and summaries that will be made available to you and other participants. A Power Point slide deck summarizing the findings and important information will also be made available. The interactive online map will be hosted on the website of the Bauta Family Initiative on Canadian Seed Security and can be accessed at the following website: <http://www.seedsecurity.ca/en/>

You will be provided with an opportunity to comment on your own case study and will be sent a copy for review prior to dissemination. If you would like to review your own case study and a copy of the final report, please provide an email or physical address so it may be provided to you.

If you do not provide your email in this consent form but need the results of the study, please contact the principal investigator, Murray Jowett, at the address provided above any time.

Compensation: Participants will be offered a \$200 honorarium that can be transferred to you via e-transfer.

Anonymity and Confidentiality: If you so choose, I will undertake to mask your participation in the results of the case study as regards information about your business/organization and innovation. I can utilize pseudonyms for your name and that of your enterprise/company and a generic location such as “located near a major Canadian prairie city.” Consent forms and identifying information will be accessible only to members of the research team and will be stored separately from interview data. If there is a need to report direct quotations in reports, publications, or oral presentations we can also use pseudonyms for you and your enterprise. Prior to the interview I will let you know which members of the research team will be present at the interview. All team members present at interviews will sign an oath of confidentiality.

There are several options for you to consider if you decide to take part in this interview. You can choose all, some or none of them. Please put a check mark on the corresponding line(s):”

I grant permission to be audio/zoom taped:	Yes: ____ No: ____
I grant permission to have my enterprise/organization’s name used:	Yes: ____ No: ____
I grant permission to have my name, organization, and value chain featured on an online interactive map.	Yes: ____ No: ____
I wish to remain anonymous:	Yes: ____ No: ____
I wish to remain anonymous, but you may refer to me by a pseudonym:	Yes: ____ No: ____
The pseudonym I choose for myself is: _____	
You may quote me and use my name:	Yes: ____ No: ____
You may use photographs of myself and the enterprise in written works and oral presentations:	Yes: ____ No: ____
I would like to receive the \$200 honorarium:	Yes: ____ No: ____
If yes, you may etransfer me at this email address: _____	
I would like to receive a copy of the final report	Yes: ____ No: ____
At email address above or: _____	

Right to Withdraw: Your participation is voluntary, and you can answer only those questions that you are comfortable with. You may withdraw from the interview and as a participant in the research for any reason, at any time without explanation or penalty of any sort. Should you wish to withdraw after the interview is completed, you can contact any one of the above-listed researchers by phone or by email. Upon withdrawal, all electronic and physical data and records associated with this interview will be destroyed. Your right to withdraw from the study applies until September 1, 2022, when the results have been analyzed and disseminated. After this date, results will be shared, and it may not be possible to withdraw your data. If concerns develop regarding your inclusion in the interactive map after Sept 1,

2022 you may contact the Bauta Family Initiative on Canadian Seed Security to address your concerns.

Questions or Concerns: Contact Murray Jowett using the information provided above.

This research has been approved by the JFREB. If you have any concerns or complaints about this project you may contact Iain Davidson-Hunt or the Human Ethics Coordinator at xxx-xxx-xxxx. A copy of this consent form has been given to you to keep for your records and reference.

Consent: Your signature below indicates that you have read and understand the description provided:

“I have had an opportunity to ask questions and my/our questions have been answered. I consent to participate in the research project. A copy of this Consent Form has been given to me for my records”

_____	_____	_____
<i>Name of Participant</i>	<i>Signature</i>	<i>Date</i>

FOR ORAL CONSENT (if applicable, for example for over the phone interviews):

If consent is obtained orally the Consent Form will be dated, and signed by the researcher(s), as below, to indicate that “I read and explained this Consent Form to the participant before receiving the participant’s consent, and the participant had knowledge of its contents and appeared to understand it. The participant was also informed that they would receive a copy of the consent obtained and signed by the researcher via email for their records”

_____	_____	_____
<i>Name of Participant</i>	<i>Researcher’s Signature</i>	<i>Date</i>

The University of Manitoba may look at your research records to see that the research is being done in a safe and proper way.

Ethics Approved Interview Guide

Go over informed consent

Record

Intro

I want to understand if/how PPB (Participatory Plant Breeding) populations are being marketed and the structure of their value chains. Part of this means understanding the perspectives of farmers and value chain partners on the commercialization of PPB. Why are people participating or choosing PPB? What can be done to help commercialize or make PPB populations viable?

Core research questions:

What comprises/comprised your PPB value chain?

How is PPB being commercialized/operationalized?

How can PPB be commercialized/operationalized?

What are the barriers or vectors for this?

Go over the guide - any questions?

Background

A bit about you:

- Entry and experience with farming
- What you are doing now (ex: crops, market orientation – refer to participant background document, can screenshare and go over it together.)

How do you conceive of PPB?

- What is it?
- Why would someone do it?
- Who benefits?
- How does it compare to your other breeding experiences?

Why and how did you get involved? (Very basic)

- What did you work on?
- Where are you at in the process?

Commercialization

The past - before marketing your population: Where did/do you *want* your PPB to go? (When you got involved, what were your goals/intentions?)

- Ex: Grain elevator, direct market, value chain partners, feed, regular streams, sold as common-grade seed, variety registration, sell as certified seed. (Perhaps not doing it for commercial reasons?)
- How did that relate to your **breeding priorities**?
 - Agronomic
 - Quality
 - Story (ex: promotional, educational, interest in genetic history)
- Did value chain partners influence breeding priorities?
- What factors helped or hindered you in moving towards these goals / priorities? (vectors/barriers)
 - Difficulty getting the traits you wanted.
 - Poorly developed markets
 - Prohibitive costs
 - Lack of support (government, institutional etc.)
 - Regulatory barriers
 - Sourcing. Does shipping or transportation present any obstacles or opportunities?
 - Encountering any intellectual property issues (Ex: AAFC potato varieties as opposed to U of M material?)
- Did you develop a variety that worked for you and your value chain?
- Describe the process of PPB commercialization

The present - while marketing your population or beginning to market your population: Where *is* your PPB going? (Where is it going to go?)

Ex: Elevator, direct market, value chain partners, feed, regular streams, sold as common-grade seed, variety registration (certified seed). Perhaps not doing it for commercial reasons?

- Who is involved?
- Processing?
- Who is buying?
- What value do you think PPB is to your value chain partners?
 - Did you promote/leverage the PPB element of your product?
- How did that relate to your breeding priorities?
 - Agronomic
 - Quality
 - Story (ex: promotional, educational, interest in variety history)
- What factors help or hinder you currently in moving towards your PPB goals / priorities? (vectors/barriers)
 - Difficulty getting the traits you wanted.
 - Poorly developed markets
 - Prohibitive costs

- Lack of support (government, institutional etc.)
- Regulatory barriers
- Sourcing. Does shipping or transportation present any obstacles or opportunities?
- Encountering any intellectual property issues (Ex: AAFC potato varieties as opposed to U of M material?)

Future: Where do you *want* it to go? (Either personally or generally) Where do you think it *can* go?

- What is your outlook for the commercial viability of PPB populations?

General thoughts and free discussion:

*NEW: What do you think value chain partners need?

- Ie, how would the needs of processors, purchasers etc affect how people participate and commercialize

What could help get PPB into use or reach its potential or help it be effective?

- Market arrangements like co-ops?
- Programs, policy changes?
- Any kind of support?
- Comments and suggestions about the program.

Discuss Honoraria