SEEDS: MORE THAN FOOD

Seed Saving in the Context of Climate Change

A Thesis Submitted to the Committee on Graduate Studies in Partial Fulfillment of the Requirements for the Degree of Master in Arts in the Faculty of Arts and Science

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1.1 Abstract

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This study used literature from the social and ecological sciences to look at the practice of seed saving in the Global North for adaptation in the face of climate change. The hypothesis is that small-scale gardeners and farmers are adapting seeds to the changing climate as they grow them, which is not the case for growers who grow only food. However seed savers face obstacles and are dwindling in number – even though the practice is thousands of years old. Using survey and interviews of seed savers in two communities in Ontario Canada (one Indigenous and one settler), this mixed methods Participatory Action Research project explores the challenges and opportunities for seed saving in the context of climate change. The results indicate that both seed savers and their crops are adapting to climate change, but that the challenges and implications diverge for Indigenous vs settler communities. A framework of recommendations to advance seed saving in a beneficial, decolonizing way is proposed.

Keywords: Seed saving, Seed keeping, Food Security, Food Sovereignty, Seed security, Seed sovereignty, Food system sustainability.

1.2 Acknowledgements

First, the Seed: I would like to express my deep gratitude to my seed friends, who have been teaching me ever since I could hold one in my hand. I would like to thank Ratinenhayénthos in Tyendinaga for many things --for adopting the seed collection when it was homeless, for taking me along with the seeds, and for the generous and patient teachings on what seeds mean to Haudenosaunee culture. I know this is what led you to support this research! Deep gratitude also goes to Dr. Michael Classens for his tireless help and guidance. His enthusiasm carried me through some rough patches, and his practical instruction was invaluable throughout. Professors in the MASS (especially Stephanie Rutherford and Asaf Zohar), ERSC and SAFS programs at Trent supported and encouraged this research. My parents Morag and Murray Henderson partially funded this project, and have unwaveringly supported all my crazy ideas through the years-and it was no doubt one of them who first placed a seed in my hand as a child. My dear husband Josh Ford was patience itself, for which I am grateful. Cerridwyn Cox-Henderson continues to critique my thought at every turn and challenges me to identify and work through underdeveloped pieces. Funding was gratefully received from Trent University and the Su Morin Foundation.

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Chapter 1: Wintertime

What would a winter evening by the fire be without some seed catalogues to browse? Wintertime is for planning the year to come, and particularly for planning the gardens which, throughout much of Turtle Island[1], are tucked underneath a layer of snow like a blanket. On the reserve at Tyendinaga Mohawk Territory and in the mostly Settler city of Kingston, ON just down the road, those with access to even small patches of land dream of gardens full of life and colour and flavour. As a gardener/farmer myself whose life is intimately bound up with the seasons, winter is the only time for rest and introspection. It was over the course of many winters that the seeds of this research were planned and planted.

Introduction

There is magic in seeds. Seeds are captivating -- small capsules that can look like no more than dust or tiny pebbles, but that contain potential that is used as analogy by spiritual traditions throughout the world! Analogy for potential: the unseen potential for growth and development, and potential for giving/benefiting each other. I keep as an example the question: will this research be as beneficial as a bean seed planted in good earth and watered by rain?

"There are profound spiritual implications to what we are doing to our seeds, which are, after all, the very source of our survival." (Meriam, 2014 pi) That such a small, seemingly insignificant thing can germinate and grow into a plant with so many functions

[1] (North America is shaped remarkably like a huge Turtle, with NWT as the head and Mexico as the tail, and the Haudenosaunee creation story begins with Skywoman landing, and building her home, on the back of a turtle).

before it flowers and sets more seeds in turn, is a miracle that has wowed us as humans for thousands of years. Is it possible that we too, seemingly insignificant though any individual may be, have the potential to be of benefit to many other beings just like the plants that grow from seeds? Even the most poisonous of plants (to us) is still important in its own ecological niche, and is eaten by something that in turn is also important in its niche. A seed is an ecological product that we have had no trouble putting a price on, and people line up to buy seeds of all types at various times of year. And yet, seeds also resist the capitalist way, since they freely reproduce themselves -- often against all odds. "The natural characteristics of the seed constitute a biological barrier to its commodification" (Kloppenburg, 2004 p11). Our food grows from seeds, or at least relies on seeds. Even the cheese and pepperoni on our pizza relied on seed (feed grains and grass grown from seeds) to feed the livestock from whence it came. If you've ever had the opportunity to run your hands through a big bowl/bin of grains or beans, you won't have forgotten that experience and the sense of security and satisfaction it engendered. As children growing up on our parents' cow-calf operation, my sister and I could climb right into the granary and wade around in all the seeds, throwing them at each other by the handful - such fun! Seeds and other non-human agents have been studied in parts of the Global South, but aren't as often considered as subjects of academic study here in North America. "In comparison [to growers in global South countries], global North growers, as participants in 'modern' agrifood orders, are expected to stop saving seed and purchase them instead each year as inputs" (Phillips, 2016, p5). This despite our continued dependence upon them and relationship with them. If we are "lawn people", as Paul Robbins suggests, then even before that we were Seed People. "In brooding about the grass, my role in its care,

and my relationship to the vast economy designed to manage it, I was becoming a slightly different kind of person, a sort of…'lawn person'" (Robbins 2007 pxii). Robbins, fundamentally, is interested in the ways that 'humans' and 'nature' coproduce. While his focus is on grass, we aren't all lawn people. Starting from a similar premise, this thesis asks, what might we, and by extension, our world look like, if we were seed people? Our human interactions with seeds are what, approximately 12, 000 years ago, set us on the path of agriculture as we now know it. Some human being, or multiple humans acting independently of each other, decided that the plant they were foraging in the wild was worth growing closer to home, and they very likely abducted it there using observation of how that plant reproduced (ie by purposely taking its seeds), or planted it by accident from seeds that had been harvested and taken home to eat, which ended up sprouting there instead (Diamond, 2002). Our ancestors long ago became "seed people". It is worth noting that there are still, of course, plants that resist cultivation and remain "wild", but some plants cooperated with humans and grew under cultivation, mainly by producing seeds to be planted again. The Svalbard Global Seed Trust vault safeguards mainly food crop and food wild relative seeds from around the world. "The number of varieties in the vault – from wheat to rice, from beans to maize – will rise to about 1,050,000 from 992,032" (Alister Doyle, 2020). What this indicates is that well over a million plant varieties agreed to partner with humans over time until now and across the globe. But over the course of the last 100 years or so, most humans, and certainly those in the Global North, have stopped keeping seeds, even though we continue to have gardens and grow food. What could possibly stop us from performing this action that we have performed for so many thousands of years? While much has been written lately on

genetic modification of seeds, farmers rights vs privilege, and ownership of genetic material in general, there appears to be a gap in the research regarding the general population's relationship to seeds, even though it has clearly changed dramatically in recent times in our part of the world. Using surveys and interviews in both the settler community of Kingston, ON and the Haudenosaunee community of Tyendinaga, ON I begin to explore and bring to life the barriers that currently exist to seed saving, as well as the tipping point at which seed savers are finally motivated to engage practically with seed saving.

The questions developed with the seed saving community include:

1. What was the catalyst that finally got you to grow for seed? Describe how you thought about growing seeds in the past, and then what caused you to actually start growing and keeping seeds?
2. What seeds did you first save? What seed crop do you now see as most important and why? Are they community seeds?
3. What were the obstacles that kept you from keeping seeds before you started?

What obstacles do you see for others in your community who don't currently grow seeds, and particularly young people?

The full list of questions is included as Appendix 1.

The hope is that this research will be beneficial by helping those engaged in saving this ancient human relationship with seeds from extinction. By helping to articulate the present-day benefits and possibilities of seed saving and by identifying the barriers currently in place, the hope is that more people can be supported in their new or existing seed saving practice. In this way community seeds can continue to be grown and

adapted to changing local climate conditions, thereby very practically increasing food security and food sovereignty. A Participatory Action Research (PAR) lens gave the community the opportunity to change the questions, give feedback on the approach and generally participate in the research process as they were willing and able, without burdening any individual or group. "The challenge is to work with a methodological and philosophical singularity in the art of doing research 'with people', in lieu of doing it 'on them' or 'for them'" (Chevalier and Buckles, 2013 p10). In this paper, I occasionally use the first-person singular and sometimes the plural. This is deliberate to indicate when I am speaking for myself alone, versus when a concept was developed with others in the seed saving community.

I have chosen to use the terms "Indigenous" and "settler" to refer to the two communities included and also specifically the respondents and interviewees. "Indigenous" is currently the accepted word that describes those descended from the people who were here before Europeans arrived. "Settler" is perhaps more contested, but I use it in the sense described by Lowman and Barker; as a word that represents a tool, a way of understanding and choosing to act differently. "A tool we can use to confront the fundamental problems and injustices in Canada today" (Lowman, E. & Barker, A. 2015, p2).

Due to the fact that roughly half of this research is done in an Indigenous community (and also because it's a good idea), there is an obligation to be very clear on certain things. As Absolon and Willett note:

In doing community-based research, for example, the Aboriginal community and cultural protocols demand to know three basic things: (1) Who is doing the research?; (2) How is

the research being done?; and (3) What purpose does the research serve to the community? When it comes to Aboriginal peoples and Aboriginal knowledge, researchers today must be prepared to explain who they are and what interest they have in the proposed research before they are allowed to proceed (Kathy Absolon and Cam Willett, 2005, p 107).

These three questions will now be addressed.

1.4 Question (1) Who is doing the research?

A Participatory Action Research (PAR) lens means that "Inquiry of this kind makes sense of the world through efforts to transform it, as opposed to simply studying human behaviour and views about reality" (Chevalier and Buckles, 2013). As a seed saver myself I am very much a participant, as well as observer in this research - over years of working in this field, certain questions came to trouble me more and more, arising from my practice of seed keeping and observation of the seed-saving "reality" in which I live. As such, I believe I have been engaging in this research for a few years now, informally asking people I encountered the questions now included here. While the answers gathered over my years of innocent curiosity are, of course, not specifically quoted, they form a general background to this work, and certainly informed my choice of methods. The seeds themselves seem to be pushing me to inquire on their behalf - why are the people not growing and saving them as they used to? As Catherine Philips notes: "Seed do have their own lives, and in some cases present opportunities to people-think for example of a plant going to seed offering a chance to save seed for next year or for the seed to drop to the ground" (Philips, 2013 p7). More on my own positionality is coming later in this Chapter. Anecdotally through my work, and of course from the perspective of the seed, it appeared that in Canada the practice of seed-keeping is no longer passed down in human families.

1.5 Positionality

I did not plant all the seeds of this research myself: in the winter of 2007-08, the Sisters of Providence of St. Vincent de Paul and retired farmers Carol and Robert Mouck made plans to hire a gardener to tend their Heirloom Seed Sanctuary ministry and thereby planted the seed for me to engage in seed saving in a professional capacity. By March 2008 I had moved to Kingston and begun this work, planting physical seeds in the beautiful glass greenhouse and planning a meaningful career of community food security and bountiful, nutritious harvests that benefited "those less fortunate", as defined by the Sisters' Mission. The Heirloom Seed Sanctuary curated a collection of 300 varieties of vegetables, flowers and herbs. All of these were "open-pollinated" and "heirloom" varieties, which for them meant "varieties that either have been, or are worthy of being passed down through generations". The Sisters included in their Constitution: "Our respectful use of the environment witnesses to the value of all creation." In 1994, the Sisters formed an "Environment and Ecology Committee. Through this committee, organic gardening began once again on the Motherhouse grounds" (see scan of HSS brochure, Appendix 2). Carol and Robert Mouck were organic market-gardeners near-by who sought to retire from the farm but to continue to grow their heirloom seed collection. The Sisters allowed them to use their "sacred inner city acreage" (from Sanctity of Seed DVD jacket) to grow the seeds and teach seed-saving. Catherine Phillips includes a chapter on the Heirloom Seed Sanctuary in her book Saving More Than Seeds, 2013.

In 2009, Kahehtóktha Janice Brant gave a presentation at Queens University about her research into Haudenosaunee seeds and foodways, which I fortuitously attended. A seed was planted that day that eventually ripened and grew into Ratinenhayénthos, the

Kenhte:ke Seed Sanctuary and Learning Centre in Tyendinaga. Our friendship and connection over seeds has been extremely meaningful and led directly to this research, which I dearly hope is beneficial to the community of Seed Keepers there. When the Sisters could no longer keep up the Heirloom Seed Sanctuary ministry due to their aging population, they "Rematriated" the seeds to Ratinenhayénthos, where they are now grown on community land in Tyendinaga, alongside traditional Indigenous varieties since added to the collection for safe-keeping. Many of the original Heirloom Seed Sanctuary seeds are likely also Indigenous, but the research to properly identify and chronicle them has yet to be done. The more urgent issue, clear to Carol and Robert Mouck, the Sisters, and Janice Brant, is that people in Canada have by-and-large stopped saving their own seeds. This is occurring just when we desperately need local biodiverse food crop seeds with the ability to adapt to whatever climate change will throw at them. It is out of this urgent need that this research was conceived. Robin Wall-Kimmerer blames climate change on simple greed, like the greedy hunger of the Windigo monster in Anishnaabe culture:

> Some argue that we need do nothing at all-that the unholy coupling of greed and growth and carbon will make the world hot enough to melt the Windigo heart once and for all. Climate change will unequivocally defeat economies that are based on constant taking without giving in return. But before the Windigo dies, it will take so much that we love along with it. We can wait for climate change to turn the world and the Windigo into a puddle of red-tinged meltwater, or we can strap on our snowshoes and track him down (Wall-Kimmerer, R. 2013 p375).

Visualizing the modern, capitalist economy as the Windigo monster from Anishnaabe culture is helpful, and an important piece of the puzzle. But there may be other barriers to saving seeds, and we need to expose and address them all.

Over the course of 11 years at the Heirloom Seed Sanctuary, as Seed Saver and Gardener and Director of the Ministry, I saw hundreds of people come and go from

workshops, presentations, tours and field days. I asked those who were saving seeds how they started and asked those who were not saving seeds "why not?". In the wintertime I asked myself these very questions, along with reading everything I could find! Until I was officially made redundant by the Sisters and my hours were reduced to part-time in order to accommodate the funding available to Ratinenhayénthos, I didn't have time to formally document literature searches, interview people properly, or write very much. Now those 11 years, plus 3 years in Tyendinaga, are bearing fruit. Interspersed in this document you will find snippets from the wintertime musings across the years with the Heirloom Seed Sanctuary (HSS) which I did manage to write down and are taken directly from my notebooks. To be clear, I want this research to **be** a seed, planted. As Martín Prechtel says in his glorious stream-of-consciousness way:

> I want this story not to be *about* seeds, I want it to *be* a *seed*, a kind of story that has its own unique running, a story that does like seeds do, starting always in the middle of their own wave pattern of infinite rise and fall, seeds who, like the grandest stories, refuse to stop moving toward life and always hope to come home instead of being genetically and spiritually modified to frenetically race away from life, not vainly pushing to outrun our continuing failures with the Holy ground that feeds us, only wreck the future we don't think is there for someone we don't know (Prechtel, M. 2012 p13).

The truth is not that seed savers no longer exist at all, but their numbers are so dramatically reduced as to be frankly inadequate to the task. I have had the great good fortune to meet many seed savers/Keepers from all over Turtle Island. I have travelled to conferences for the Organic Seed Alliance and the Eastern Canadian Organic Seed Growers Network as well as to various Seedy Saturdays and Sundays. I have acted in an advisory capacity to the Community Seed Network and occasionally to the local work of SeedChange (formerly USC Canada).

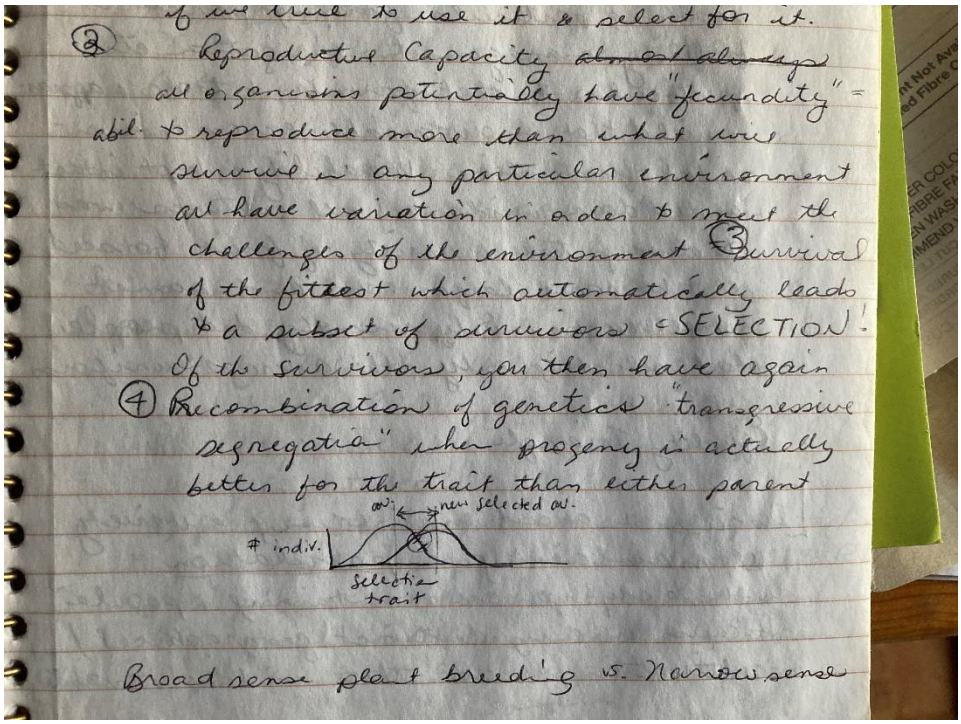


Figure 1 Notes taken at Eastern Canadian Organic Seed Growers conference Ottawa, March 2009

My original intention was to interview folks from my travels - to cast the net very widely across the continent. But this proved too large a task for one MA thesis, so I have focused on the two communities in which I work directly: Tyendinaga and Kingston, ON. These two have striking similarities but also differences, and I think serve to highlight how seedways have been gradually forgotten/lost for both, but with very different histories and implications. It is my hope that communities of seed savers across Turtle Island will find answers that resonate for them as well. I have learned that likely Canada's Seed Act can trace its birth all the way back to the Doctrine of Discovery, and that hundreds of years of displacement and deskilling of Indigenous Peoples, the legacy of this Doctrine, play an important role in the modern seed landscape. As the *National Post* noted at the time of the Pope's visit to Canada: "This idea that European Christians could claim land that did not belong to them, which is inherent in the Doctrine of

Discovery, paved the way for policies like Canada's Indian Act as well as the residential school system" (Mundie, J., 2022). "The Doctrine of Discovery was a specific tool designed by the Catholic Church that ultimately became and still exists as a principle of discovery enshrined in law" (Tuhiwai Smith, Linda. 2022 p22). Seeds, like the land, were also "discovered" and claimed for European use. There will be more on this in later chapters, including some thoughts about the potential of seed saving as a decolonizing action -- as healing and relationship-building for both Indigenous and settler folks involving the land: in right relationship with the land. This was one of the themes that emerged strongly from the research, and which is deserving of more attention.

1.6 Question (2) How is the research being done?

In order to establish this, I first offered a brief survey through Seedy Saturday on-line events in Kingston and an in-person Seedy Sunday event in Tyendinaga. Participants were specifically asked how long they had been saving seeds, and in by far the majority of responses it was a relatively short time. Only 2 respondents (representing roughly 6%) claimed to be saving seeds since childhood. With this base information, plus a general confirmation that people do believe seed saving is important for a variety of reasons, including climate change, I set out to gather information about what does lead people to finally engage in seed saving, through in-depth interviews with seed savers.

1.7 Question (3), the purpose of the research

As a Participatory Action Research project, survey and interview questions were developed with the participation of the seed saving communities with which I work. I include in my final section recommendations to support more engagement of small scale,

local seed savers, in the hopes that food crop seeds will be increasingly grown in communities for local use in a good way. This is the main purpose of this research – to benefit and support the practice of seed saving/keeping. When food security is important to community resilience in the face of difficulty, this mixed methods study clarifies how seed savers perceive their role in, and contribution to seed and food security in the context of climate change. While the seed savers responses did clarify how they view seed saving in the context of climate change and local food, themes developed that could help to guide community seed saving into the future in a good way. Those themes are articulated around concepts of Gender, Decolonization, and Adaptation of Practice. This has been outlined above, but there is one very important finding from this research, which deserves complete clarity before moving on (and will be discussed in detail in Chapter 4). Although not specifically the purpose of the research, it will be beneficial to the community to be clear that seed saving has the potential to be just another extractive, colonial activity. Seeds must be saved by more growers in more home gardens and farms, but we must be very careful to do this in a good way. We must endeavour to be mindful of cultural protocols around seeds, as we engage with them. We may not know the specifics as we grow food crops from all over the world, but our intention is important: the seeds are living beings who have been in reciprocal relationship with humans for thousands of years, and we intend to treat them well and be grateful. Not only will this enrich our experience of seed saving, but if we don't keep this intention, then we are not far off from the corporations that use seeds for profit and control-the very corporate system many seed savers wish to avoid.

1.8 What is Seed Saving: A Closer look

Seed saving is the act of taking mature seeds from a plant and saving them -- putting them in an envelope or jar and setting them aside. Presumably, the intention is to plant the seeds and then save more seeds, but it is possible to "save" seeds for too long such that they are no longer viable. Seeds are alive in the sense that they are baby plants -- the offspring of mature plants -- and they will not survive indefinitely in dormancy, contrary to popular belief. There are miraculous stories of seeds germinating after hundreds of years, but this can only happen if the conditions under which they were dormant are perfect and they were perfect seeds to begin with. Some varieties of plants naturally have longer dormancy periods built into their seeds than others. Of the common garden varieties, for instance, tomato seeds can be safely stored, and remain viable, for over 20 years, even under less-than-ideal conditions. Parsnip seeds, however, lose viability dramatically after just 2 years under good storage conditions.

Seed saving is also generally understood to mean growing the plant from seed to seed, and then saving that seed. In other words, seeds are first acquired by various means, then grown out by the person who acquired them to the point where they flower and set seed again. Seeds are not necessarily acquired from other humans, since some restoration ecologists, for example, will go out into "the wild" at specific times of year to collect seeds from wild plant species and save them, in order to propagate them for future restoration projects. These wild plants are often perennial, which means they grow back from the same root year after year for many years. But food crops, which are the focus here, are mostly either annual or biennial, which means the root survives only one year (annual) or two (biennial). Then the plant must be grown again from seed, if the crop is

to continue. Many crops that we grow as vegetables are, in fact, perennial in their "centre of origin" (Vavilov's research on crop wild relatives led to the identification of these centres of origin-where the ancestors of todays "domesticated" crops still survive in the wild, or where evidence has been found of their historical prevalence) (Vavilov, N 1928, Hawkes, J 1999, Maxted, N., Vincent, H 2021). This means that they have the potential to be perennials again, and if the climate changes in favour of this potential, then we can expect to see more of this. Another possible side effect of a changing climate will be "self-seeding" annuals: the phenomenon of seeds falling to the ground, surviving through the winter, and growing again in spring on their own. Some Buddhist prayers include offerings of "the harvest unsown", which is considered the gold standard and consists of edible seeds and plants that spring up on their own, as "harvests that need no cultivation" (Shantideva, AD 687-763)! This is already happening as some climates warm and winters become less harsh. I have kale plants in my garden that have become perennial, and I now have one variety of tomato that reliably germinates in the same spot every spring because seeds fell and survived the winter. It has become a weed, in fact, because so many germinate all together as to clog up that space! One interviewee discusses this, using parsley as a specific example. In the past parsley did not survive the winter in her garden, but now it often does (but not always). It used to be common that certain seeds would survive and germinate in compost piles: this was believed to be because there is low-level heat generated there year-round due to the biological activity of the bacteria and so on. But nowadays seeds that used to survive in the compost heap alone, happily survive in lowly garden soil, and we end up with what gardeners lovingly call "volunteers", i.e., plants that voluntarily come up in spring from leftover seed that fell

accidentally. When I teach seed saving to others, I often encourage people to recognize this phenomenon as seed saving. By leaving some seeds in the garden and letting them germinate in place, we are adding (beneficial, non-weed) seeds to the "soil seed bank", which are the thousands of seeds that lie dormant in the soil itself. Most people I have spoken to over the years find it hard to believe in their ability to save seeds, so using this as an example of seed saving is very encouraging, especially since it happens more and more frequently these days.

There is an interesting difference in semantics between how settler folks describe the above actions vs how Indigenous folks in Canada describe it. Settlers call it seed saving, as mentioned, but Indigenous folks (at least in Tyendinaga) call it seed "keeping". Functionally the two are much the same, but I do believe that the two terms reflect some essential difference.[2] In this research, it was found that settler growers are very prone to trying out (or "trialling") many different seed varieties and saving seeds from the ones they like, for as long as they like them.

[2] I have not found any analysis of this, but to me it is reminiscent of "white saviour" complex. White people are "saving" the seeds, whereas Indigenous folks are "keeping" them. This research is not concerned with linguistics, alas, so I must move on, but I would love to see some deconstruction of these two terms at some point!

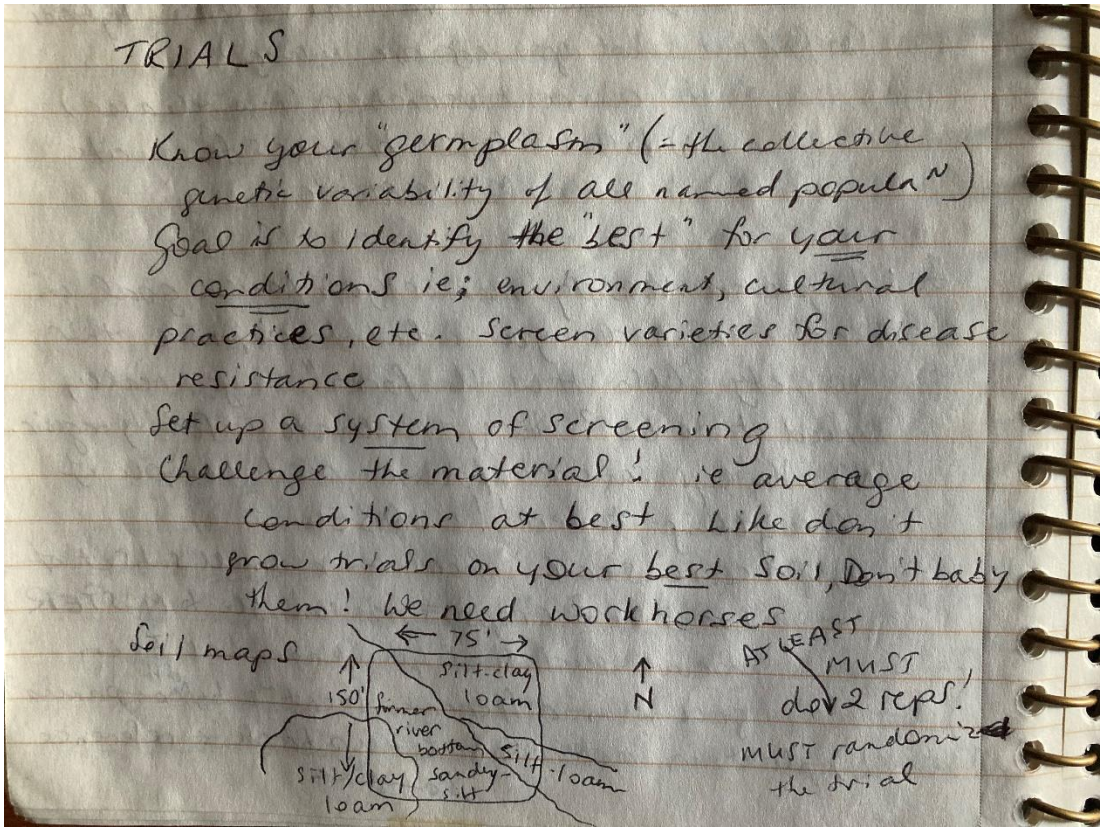


Figure 2 Notes on Trialling plant varieties from workshop

If, at any time, they cease to like something well enough, or they find something they like better, they have no qualms about stopping their seed saving practice of that variety. In other words, they are not attached to any particular varieties, and see no problem in "letting them go". Dr. John Navazio, a plant breeder with one of the larger seed companies still growing their own seeds, discusses this phenomenon amongst settler seed companies, which have become increasingly consolidated since the 1970s.

> Whole market classes of vegetable varieties are being lost as an inevitable result of this [consolidation]. Many varieties that have a certain specific climatic or cultural adaptation, or perhaps have specific market traits that are considered limited in their sales potential for the new corporate owners, are cut from a company's sales list and replaced with varieties that have more universal appeal…The varieties that are dropped are the ones less well suited to large-scale centralized agricultural areas (Navazio, 2012. VII).

Perhaps using the term “keeping” reflects the more permanent nature of Indigenous seed keeping, where varieties are culturally tied to the community and the members thereof wouldn’t think of “letting them go”, at least not entirely. Individuals may, of course, decide they are no longer practically able to put the physical work into growing a garden, but their wish is that the community varieties continue to be grown by younger, more able people-the next generation. To this day, care has been taken that they not be lost entirely, although it is getting more and more difficult to pass the seeds along. One senior Indigenous seed keeper I know has used his own funds to create attractive posters complete with photos of these varieties-one poster for corn and one for beans (see Fig. 3). He strongly encourages youth to engage in seed keeping.

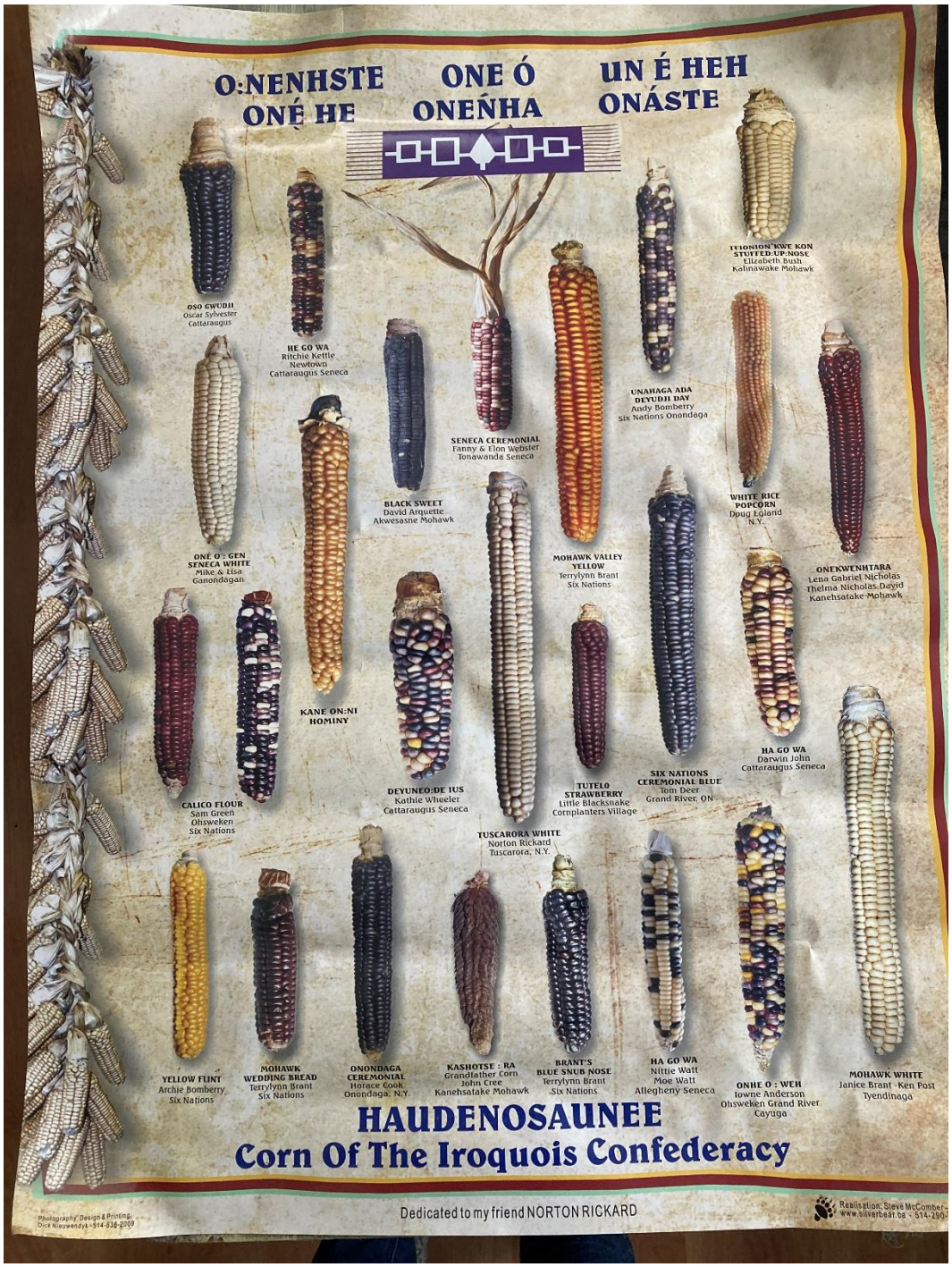


Figure 3 Haudenosaunee Corn of the Iroquois Confederacy by Stephen McComber

More than just the practice of harvesting and storing seeds, then, seed saving is also a choice made within a broader context. Cate Phillips expresses it as follows:

> …seed saving is more than a simple technique…Seed saving is a set of practices that raises vital ethico-political questions: who has access to seed and for what purposes?; whose knowledge is valued and how?; who/what participates in arranging seed relations and how?...They are expressed in louder and more urgent tones as seed saving becomes increasingly constrained and controversial with the reordering of agrifood through, for examples, corporate priorities, governmental policies and changing agricultural practices (Phillips, 2013. P4).

Phillips goes on to examine the agency of seeds themselves: the "non-human agency".

> Acknowledging nonhuman agency is vital to broader debates that unsettle dualisms between nature and culture, human and nonhuman, active and passive...Challenging human-centredness does not suggest that nonhumans have the same agentic capacities as humans; rather, the aim is to find ways of recognizing nonhumans, their lives and relations, for what they are in and of themselves, to acknowledge differing and uneven experience of affecting and being affected (Phillips, 2013. P6-7).

Seed saving is thus an important interaction between the human and nonhuman, where each depends to some degree on the other for something very important: food for the human and a next generation of life for the plant.

What is seed saving in terms of practice? There is considerable variation in practice. As mentioned, just the act of allowing a plant to go to seed and fall to the earth can arguably constitute a practice of seed saving. However, generally the practice of seed saving is more active on the part of the human, since it requires growing the plant in an appropriate population size, observing and removing members of that population who don't grow in an acceptable way throughout the growing season, and then watching for the correct level of maturity at which point the fruit/seeds can be collected, dried and processed for storage and sharing. Collecting, drying, processing, storing and sharing seeds each constitutes a separate practice, and some basic knowledge is required at each stage without which the seed crop can be entirely lost. I once lost a 500mL jar of bean seeds, for instance, because they were put in their glass jar without enough time to dry-

seeds with too much water content will still be active and try to grow, at which point without soil and the right conditions, they will proceed to rot, which is exactly what these beans did. Many people think beans are "ripe" when they are green (because most people in North America eat green beans, these days). But collecting and planting a green bean will not produce a bean plant, because at the green stage the seed is too premature to survive. Seed saving therefore constitutes a set of knowledges, that enable the practice to be successful.

In addition to concepts of what seed saving *is*, exist concepts of what seed saving *can/could be*. Seed saving can be a critical life-saver for those who must be completely self-sufficient. It can be a fun experiment for those who don't feel the need to be self-sufficient and don't mind buying food generally. I believe it could be a marketing ploy for a small farmer selling to a local market. I tried this myself, with some success, when I co-owned a farm and sold at the local farmers market for a couple of years. I advertised that the veggies on offer were grown from farm-saved seeds. Seed saving can also, importantly, be an act that reinforces colonialism, or conversely, an act of decolonization. I will elaborate on this idea later, since this is a theme that emerged from the research. I have spent much of my adult life trying to convince people to save seeds and teach them the skills they need to do so. But I now believe that seed saving in and of itself is not inherently beneficial. In fact, we must be aware of seeds as "biocultural heritage" (Argumedo 2005) (more on this later as well). Seed saving can be simple hoarding-and I hope we don't find out that's the real purpose behind the Svalbard Seed Bank!

My personal practice of seed saving has been extremely rewarding. At the time of entering employment with the Sisters of Providence Heirloom Seed Sanctuary, I was told

that the seed collection consisted of 450 varieties! There were 100 varieties of tomatoes alone, plus a few varieties that are called seed even though they are not biologically/technically seed: Potatoes and garlic both fall into this category. Neither potatoes nor garlic typically set true seed, but the tubors (potatoes) and cloves (garlic) are dug and replanted and will multiply as clones. I did my best with what I was assigned, but I found that many varieties were already eroded to the point of no return, and the potatoes contained a virus that was present in the soil and could not be eradicated, so I sent all potato varieties to the Potato Gene Research Centre in New Brunswick, where they could be "cleaned up" and still reside as samples today (meaning that we could get them back at any time). I was able to source good quality seed of some of the varieties in order to return those to a more genetically robust state, and in 2019 we "rematriated" 270 true seed varieties, plus the garlic, to the Kenhteke Seed Sanctuary and Learning Centre in good shape. One of my heroes in seed saving, Dr. John Navazio points out:

> In a very real sense we have lost the diversity of *people* who know how to perform all the steps in this process, which isn't about just growing the seed, but also maintaining the variety, keeping it free of seedborne diseases, and harvesting and milling it to the point where it's suitable for commercial use (Navazio, 2012, pIX).

Needless to say, I am very attached to those 270 varieties, having fought for their survival and spent years learning how to grow and maintain them from seed to seed. They represent varieties of onion, cabbage, kale, lettuce, beans, tomatoes, eggplant and just about every other commonly grown garden vegetable. Between all of them there is difference in how the seeds are grown and saved. Learning about onions won't help you much with cabbages, even though both are biennials, requiring two years to go from seed to seed again. I always recommend seed savers start with the easiest types, which also

happen to be yummy to eat. Beans and peas, lettuce and tomatoes are all mostly self-pollinating species, which means you don't have to worry much about the pollen crossing into another variety and mixing up the next generation. They are also all annuals, so they produce seed in the same year they are planted. And all of them allow you to eat some and still save the seeds (which is not true of all crops). If a seed saver masters these crops, and then goes on to master squash (which is relatively easy) and corn or a grain of some kind (more tricky), then that seed saver would be basically self-sufficient in nutrition for the rest of their life. If they had access to salt and added to their seed saving repertoire onions, garlic and a few herbs (or planted perennial herbs), then their diet would also be quite delicious! As a seed saver myself, I can attest to the experience of superior flavour of the foods I have grown from my own seed. I am now much more conscious of the "lineage" of what I eat, simply because experience tells me that will determine how delicious and nutritious it tastes! I always prioritised buying organic produce because of the environmental benefits, but now as a seed grower I also buy organic because I am familiar with the seed companies that supply organic farmers. John Navazio, whom I quoted above, is a seed breeder for one of the (very few) U.S.-based companies that commonly ships to Canadian organic farmers and market growers. Having met him I feel confident in that company's seeds and their lineage. In fact, he may well be using some corn seed I gave him in a breeding project!

1.9 A Brief History of Seed Saving

According to different accounts, it was between 12,000 and 10,000 years ago that humanity started saving seeds. Arguably the beginning of agriculture itself, seed saving was the only way to grow food deliberately for millenia. Plants that had formerly been

collected from the wild to eat (foraged) were transplanted or planted from seeds close to the community settlement in soil that was readied for such a purpose in various ways (Diamond 2002, B.D. Smith, 1995). People must have observed that plants responded to water, and therefore decided that it was worth collecting and sharing their water with those plants so that they would grow.

According to *National Geographic*, "The domestication process began when people chose wild plants that would be useful for eating or making clothing, harvested their seeds, and deliberately planted them. Over time, people took seeds from farmed plants, which had desirable qualities like taste or size, and used these seeds to grow the next year's crop" (National Geographic Society, na. July 2022). Further:

> In Mexico, squash cultivation began around 10,000 years ago, but corn (maize) had to wait for natural genetic mutations to be selected for in its wild ancestor, teosinte. While maize-like plants derived from teosinte appear to have been cultivated at least 9,000 years ago, the first directly dated corn cob dates only to around 5,500 years ago (National Geographic Society, na. July 2022).

All around the world, however, a similar "revolution" was taking place. From the Fertile Crescent to Mexico to Asia, agriculture, through domestication of plants and animals, spread. As far north as the Outer Hebrides in Scotland, landrace rye grain is still (but rarely) cultivated as it was documented in 1695 (Blackley, S et al., 2022. P139). And, of course, here on Turtle Island European explorers found vast agricultural fields growing from the earliest contact, even further north (Parker, 1910, Crosby 1994, MtPleasant, 2011 etc.). For thousands of years, humans were mainly pastoral, and grew food for their own local communities, often using trading as the dominant economic system. Agriculture was a latecomer to capitalism and commodity trading, as already mentioned (Kloppenburg 2004, Clapp 2020). And a brand new report from the ETC

Group (2022) states that, in terms of seeds and propagation material, peasant farmers still contribute 80-90% of the global supply. However, global supply includes all seeds used to grow food, whether used on-farm, sold, traded, or gifted - this is different from the global seed market, which only includes seeds that are sold. This is great news for the Global South, where the peasant food web still feeds most of the population, but here in the Global North where we are fully integrated into capitalism and typically buy our seeds, we need to pay attention to the global seed market, which is only the seeds that are sold. "25 years ago we reported that the top 10 seed companies controlled 40% of the Global commercial seed market. Today just two companies control 40% of the market" (Shand et al. 2022). This will be further explored later on.

In the past, it was farmers –those who mainly used large quantities of seed –who saved seeds. However, at least in the Global North, this is no longer the case. In the winter of 2022, the third and most recent iteration of the "State of Organic Seed Report" was released by the Organic Seed Alliance in the US. It paints a picture of the current seed landscape from a farmer perspective, and reinforces the urgency described above.

From the Organic Seed Alliance (OSA) State of Organic Seed report 2022:

> ORGANIC SEED AS A CATALYST FOR CHANGE Seeds are alive and adapt to changing climates through seed saving, selection, and other classical plantbreeding techniques. This adaptation is key for a crop's survival—mitigating risks for growers and the communities they feed. Organic plant breeding and organic seed are therefore key elements of adaptable and resilient farming systems. When these seeds are grown organically, the climate benefits are even greater. For example, organic seed is produced without fossil fuel-based fertilizers, a major contributor of greenhouse gas emissions. Organic seed provides other environmental and human health benefits as well. This is most evident when looking at the number and volume of chemical pesticides applied to farm fields—including conventional seed fields—each year that result in harm to non-target organisms, water and soil quality, and human health. Organic seeds are

> grown without synthetic chemicals and are not treated with synthetic chemical seed coatings, so growers who plant organic seed are choosing to keep pollution caused by synthetic pesticides out of our soils, water, air, and food. We also believe that a healthy seed system is decentralized, with many decision makers at the table: seed growers/savers, plant breeders, farmers, consumers, chefs, food and seed businesses, Indigenous seed keepers and tribal nations, and others. In important ways, the expansion of organic seed systems has embraced decentralized approaches to plant breeding, seed production, and distribution. And as a social movement, we believe that organic seed can take a distinct path from the dominant conventional seed industry, where consolidation and privatization are key strategies. As the seed industry further concentrates ownership of seed, we see evidence that organic seed growers and their networks are striving to expand the organic seed supply through strategies of decentralized power and ownership to avoid the negative consequences of consolidation and privatization.

The report noted negligible changes in usage of organic seed among organic producers, although fewer farmers reported saving seed for on-farm use compared to the previous report. Also, "Most organic producers source their seed directly from seed companies through websites, catalogs, and sales representatives. **A much smaller percentage of organic producers source seed from their own production (emphasis added)**, stores, processors, buyers, or other farmers" p4.

"A quarter of farmers are using saved seed, and nearly half are producing seed for onfarm use or to sell commercially… The lack of training, economic opportunity, and seed processing facilities were the top factors keeping farmers from growing organic seed commercially" p5. One conclusion from the report was regarding climate change: "Climate change is severely impacting organic seed growers. Numerous growers reported extreme weather events and unpredictable changes in their climate as a serious challenge. Policy actions and research investments are needed to mitigate the impacts and increase the climate robustness of our crops and seed systems" p5.

This particular problem of growers and communities inconsistently saving/keeping their own seed is a wicked one. Since seed saving is a longstanding practice, it took many

years to seep into the North American mindset, and many disparate events, whether social, political, economic or physical (such as the droughts of the 1930s) played roles in the current lack of seed growers and savers over time. It has not been adequately studied, partly because it straddles the line between the hard and social sciences. As Marshak et al point out, "the separation between the social and natural sciences in research institutions and educational practices has meant that scholars have

> …for the most part ignored the existence of interlinked/interdependent evolutionary processes between cultural and biotic systems (Gual and Norgaard 2008, 1). In talking about "ecological deskilling in agriculture" we are therefore referring to the intertwined nature of social and ecological relationships in agricultural systems and how their coevolution can be altered, reoriented and/or ruptured through the introduction of new seed technologies (Marshak, M. et al, 2021 p1191).

A transdisciplinary perspective is clearly necessary here. According to Brown et al, a "wicked problem" is "a complex issue that defies complete definition, for which there can be no final solution, since any resolution generates further issues, and where solutions are not true or false or good or bad, but the best that can be done at the time…they resist all the usual attempts to resolve them" (Brown et al, 2010, p4). These types of problems must be tackled across disciplines in order to avoid oversimplification. One of the reasons for the decline of seed saving in North America was a gradual deskilling of farmers. This will become clear in the Chapter "Adaptation of Practice". Fitzgerald points out:

> …I would like to pursue the argument that hybrid corn was an agent by which farmers were effectively deskilled. A biological artifact, hybrid corn presented farmers with a novel set of opportunities and problems that were not apparent in their previous experience with mechanical innovations. Despite the obvious differences between tractors and seeds, however, the similarities between the two sorts of innovations are striking. If the farmer is viewed as a laborer who possesses a set of manual and mental skills, then hybrids were perhaps more profoundly deskilling than any mechanical implement (Fitzgerald, D. 1993. p327).

The same phenomenon has affected farmers and home gardeners alike. Nowadays there are many more home gardeners than there are farmers (a Canada-wide report from Dalhousie U in 2020 "suggests that 51% of respondents grow at least one variety of fruit or vegetable in a garden" (Mullins, L. et al 2020 p2), whereas the "farm population", which includes both farm operators and their families, is 2% of the population according to StatsCan (2011National Household Survey). Spending the winter months pouring over seed catalogues can help narrow down the final seed purchase list for home gardeners, whether hybrid or open-pollinated seeds-both are available for sale. Purchasing seeds from a local grower, I would argue, is a valid way of participating in your local seed system and supporting locally-available and -adapted seeds. The trouble lies in knowing who actually grows their own seeds, vs who imports and repackages seeds under their own label. There is no requirement in Canada to disclose where the seeds were actually grown or when, and in my experience most seed companies (but not all) are reluctant to discuss it. My friend and colleague Aabir Dey made a brilliant case for "A Cooperative Model for Vegetable Seed Production" in his MES thesis in 2012, arguing that local seed production could be appropriately scaled up and marketed much more effectively using this model. The current situation is very piecemeal, and small seed companies spring up and then go out of business very quickly because they cannot compete with the low prices of imported seeds, or grow and offer the (perceived) wide array of varieties available from the corporate seed houses (Dey, A 2012 p4).

Chapter 2 : Spring

2.1 Methodology and Methods

This study was designed as a Mixed Methods study, comprised of three parts, including: (a) a quantitative survey to a large number of seed-curious folks to establish some baseline parameters, (b) followed by in-depth interviews with active seed savers to flesh out those results, and, (c) a follow-up survey offered broadly for further confirmation. It was to follow the seasonal cycle of the seed saver: winter deliberation and question-formulation, spring Seedy Saturday events where seed-curious folks gather in large numbers, skipping over summer, when folks are too busy in their gardens, then fall interviews followed by more winter deliberation, then another round of spring Seedy Saturday surveys as follow-up. In 2019, over 600 people attended Seedy Saturday in Kingston -- many of them there to buy seeds rather than as active seed savers trading seeds. They were certainly "seed-curious": perhaps there to attend a workshop on seed saving or to ask questions of active seed savers. So, it seemed like the perfect plan. In 2020, at the very last minute (the Friday morning, in fact), Kingston Seedy Saturday was cancelled due to COVID19, one of the first of many events to be affected by the pandemic. I began the formal stage of this research in the fall of 2020, and I was still on the planning committee of Kingston Seedy Saturday. We believed that we would be back in-person by springtime of 2021 and likely bigger than ever, based on seed sales the previous spring. Certainly seeds became "the new toilet paper" (Robinson A. 2020), and seed companies sold out of many varieties. But Seedy Saturday was not to be; we ended up hosting an on-line version of the event at which I invited folks to participate in the survey, but attendance numbers were way down and we hadn't really figured out how to

share seeds safely, so it was more about sharing information (and to some degree pleading for help) than sharing actual seeds. Even after a well-meaning friend shared my survey on Facebook (NOT part of my original plan!), still only 19 people chose to participate in the survey from Kingston. Tyendinaga hosted a very small, in-person "seed share", where a small number of seed varieties were offered from the Heirloom Seed Sanctuary seed collection, people ordered on-line, orders were made up well ahead of time and then brought to an outdoor location for people to pick up at their allotted time, masked, gloved and sanitized to the hilt. The people who placed orders for seed were also invited to participate in the survey at the time they placed their order, but again, only 11 chose to do so (which wasn't bad considering only 20 ordered seeds for pick up). The interviews experienced similar roadblocks. Although the Kingston/settler interviews went very smoothly and more-or-less on schedule, the interviews in Tyendinaga were held up. As a Participatory Action Research project, I wanted to make sure the methods were beneficial and included feedback from the community. In order not to be a burden, however, I did make up a draft set of questions based on my research topic and sent them to friends involved in the seed keeping community in Tyendinaga for feedback. I was able to present them at a meeting of Ratinenhayénthos for discussion, and sent them electronically to that group. The questions went back and forth a bit, and in the end we had a good set of questions, but the preference was generally for "group discussions", rather than individual interviews. Again, it seemed COVID19 was dying down and there would likely be a way we could safely gather in small groups at the local library. I got formal permission from the library to use their space, put in the amendment to the Ethics Board and after a month or so of back-and-forth tweaking it was approved. However we

were hit with another wave of COVID19 (an even worse one), such that gathering even in small groups was forbidden. We went back to interviews, which could be done over Zoom, but Ratinenhayénthos made a request that there be 2 amendments to the consent form to comply with the principles of OCAP (Ownership, Consent, Access, and Permission): namely that participants could choose to offer copies of the recording and/or the transcript (the raw data) to Ratinenhayénthos for their records and to stay in the community. This took a bit longer to get through the REB, partly because I missed a step in the on-line submission process (so, my own fault), and by the time I was doing interviews in Tyendinaga, it was spring and the seed share event had already passed. We likely could have gone back to a group discussion format, but we had run out of time, so it was agreed to proceed with interviews. In the *PAR Handbook*, there is a highlighted section entitled:

> Just Do It
>
> As important as participatory methods are, Process Design may not lead to new tools but rather familiar and well-established ways of doing things that reflect local culture, known procedures and customs. PAR practitioners must judge when the established ways to gather and anayze information, create priorities, resolve problems, take action and interact with others are working well enough for the task at hand. When they do work, the best action inquiry strategy lies in "just doing it" (Chevalier et al. 2021 p8).

This was advice I took.

Interview participants were sought through Ratinenhayénthos -- an advertisement was approved through the REB and posted on the groups' socials, and also included two months in a row in the Mohawks of the Bay of Quinte official newsletter. It was also shared by email from the group as they saw fit. Unfortunately, once again, response was very low. One member of Ratinenhayénthos got a phone call from a member of the

community to see if the advertisement was legitimate; she assured the person it was and they should contact me, but that person never did reach out. Research has been done very badly in this community, and I have heard stories of information being "extracted" in a very disrespectful way, where the researcher has clearly benefited, but that benefit was not shared with the community at all. All members of Ratinenhayénthos agreed to be interviewed, for a total of 8 people, but no other seed savers from Tyendinaga chose to be interviewed.

In Kingston, the Seedy Saturday event was cancelled and the planning committee I sit on was dissolved (hopefully temporarily), but then at the last minute the Kingston Area Seed System Initiative (KASSI) folks did host an on-line info session "as a place-holder for Seedy Saturday". I was unable to attend on such short notice and hadn't prepared a survey because I thought it had been cancelled, but attendance was very low apparently. A colleague from Ratinenhayénthos attended and spoke about our work in Tyendinaga, so it was a good collaboration between the two groups at least, but no follow-up survey was administered in either community. In Kingston, interview participants were selected from a group of people who I knew personally had been involved in the Heirloom Seed Sanctuary and were emailed invitations as approved by the REB. Three people chose not to be interviewed (all of them men --more on gender issues later), but the majority agreed, and I ended up with a healthy 12 responses from that community. The research design matrix and results tables are included as Appendix 4.

Creswell describes "sequential mixed methods are those in which the researcher seeks to elaborate on or expand on the findings of one method with another method…the study may begin with a quantitative method in which a theory or concept is tested, followed by

a qualitative method involving detailed exploration with a few cases or individuals" (Creswell, 2009, p14). This was the intention, however I had hoped for another quantitative survey in order to "generalize results to a population" (Ibid). It would likely have proven too much data and therefore difficult to process, so I believe things happened as they did for a reason. Perhaps a future research project could use the data collected here and do a much larger survey-type exercise. Seedy Saturdays and Seedy Sundays all over North America present an ideal opportunity for this type of research, as does the relatively new "Community Seed Network" online. Interview participants were chosen using my existing relationships within the seed saving community. In Tyendinaga, a further process was necessary -- that of receiving permission for the research from the Band Office. Once this was done, I was able to print an advertisement in their newsletter (see Appendix 3) and the same advertisement was posted on Ratinenhayénthos' social media, and shared with the Kanhiote Public Library. Unfortunately, I received no responses from any of this, and ended up interviewing only members and staff of Ratinenhayénthos as mentioned. In the chapter entitled "Summertime", more analysis is offered on research as threatening and extractive for Indigenous communities, which explains why this might be the case, in addition to the fears surrounding COVID-19 in this community. As such, I feel very grateful to Ratinenhayénthos for their support, and am even more committed to using the research results in a beneficial way. Since I have been a seed saver myself for most of my adult life, autoethnography was added as a method, to hopefully increase the richness of the narrative.

The questions developed for both the survey and the interviews are not exclusively or overtly about climate change, since it is well established that adaptation in

plants primarily takes place at the reproductive stage, when genes from at least 2 parents (sometimes more) combine to form new possibilities best suited to the growing conditions the parents encountered (Chapman S.C. et al., 2012; Anderson, J. T., & Song, B., 2020). For millenia, humans have moved crops around the globe and selected parents for new characteristics, in the knowledge that either the experiment would work and the plant would adapt, or it would fail and there would be no next generation -- no seed. Both Gregor Mendel and Charles Darwin are famous for their pioneering work on genetics, but long before them, Indigenous plant breeders selected maize and gradually moved it northwards (and outwards), helping it to adapt to shorter seasons, hotter and cooler temperatures, various soil types and many other previously unknown conditions. Many other crops have similarly been supported by Indigenous peoples to adapt to changing conditions across time and space for thousands of years. This principle is well established, therefore although I felt it was important for current seed savers to think about whether their crops were adapting -- both to the changing climate and to their growing techniques -- I did not feel it necessary to push this concept of crop adaptation to climate change. More important was to understand why these growers were saving seeds in an era/society where this practice has largely been abandoned (did climate change figure into their decision to save seeds?), and what obstacles exist to home growers to grow their crops to seed, thereby increasing adaptation to the changing climate as already established. Rather than focusing on the negative and interviewing people not saving seed, it seemed more productive to interview folks who began saving seeds as adults -- people who would remember the obstacles they previously faced and how they overcame those obstacles. In relation to climate adaptation, I also wanted to explore the idea of

"community seed" as opposed to corporate seed, because community seeds are more likely to be adapted to the community that stewards them/in which they are grown.

While the specific methods chosen for this study were not, in and of themselves revolutionary, it seems that applying them in accordance with Participatory Action Research and the ethic of Ownership, Control, Access and Possession are relatively new to the community of Tyendinaga, or at least to the experience of having a settler engage in research there. It took time and engagement to figure out how to ethically proceed, and even when all the bases had been covered as far as Ratinenhayénthos and the Mohawks of the Bay of Quinte Band Office (and, of course, the Trent Ethics Review Board) were concerned, still we waited in vain for more community members to respond. I believe we would have had more success with Discussion Groups in Tyendinaga if we had been able to host them. However, COVID-19 was very serious business in this community, as it was everywhere, which meant that limiting contact was necessary.

Coding the information gathered in the interviews took place very organically. After several readings of the material, it became clear that multiple participants across both communities were addressing similar themes. The theme of gender seemed to emerge right away, before even reading the responses, since simply by the numbers, it was women who responded as by far the majority, not to mention that I, the researcher asking these questions, am a woman. Upon analyzing the responses, I discovered that although no questions were asked about gender, still it came up on multiple occasions. This is important because it indicates a discrete segment of the population who are apparently already more predisposed to save seeds. If we need more seed savers to increase locally-available and -adapted food, then it helps to know who best to "market" the idea to. The

theme of decolonization became very clear through analyzing responses on community seed, and also on the particular practices of seed growing: differences among the two communities pointed very clearly in this direction. The work of decolonizing what we currently know as the country of Canada is a huge project, but one that has finally begun after hundreds of years of harm. All the ways we can decolonize must be identified and addressed honestly, including seed saving. Adaptation was something I was looking for: it was articulated in the questions from the beginning. What was surprising, however, was how it plays out, and the insights there behooved me to discuss it as a discrete theme.

2.2 Preliminary Findings

As mentioned above, the idea of community seeds was interesting to me, as opposed to corporate seeds which are bred to grow with a certain suite of chemicals, or to produce an expected yield-not to be adapted to regional climates per se. Proponents of Gene-editing technologies like CRISPR (clustered regularly interspaced short palindromic repeats) claim that:

> ...they have the potential to reduce greenhouse gas emissions, improve resource efficiency, and reduce chemical use. Critics, on the other hand, have raised concerns that these technologies will only reinforce the industrial agricultural model…the model still depends heavily on chemical use and genetic alteration of seeds, the effects of which we may not fully understand for years. Critics also argue that this model reinforces uneven power dynamics between the corporations that control these technologies on one hand, and farmers on the other hand (Clapp, J. 2020 p187).

If the plant breeding technology must be used with high-tech equipment in a laboratory or controlled field, then it is beyond the reach of most farmer/gardeners, whereas simple adaptation through seed saving is not. Getting the wording right for the questions was critical, since terms like “adaptation” and even “climate change” may be understood in

different ways. I was happy to have feedback from Ratinenhayénthos members on the wording of several questions. A "Tip" in the PAR handbook says "The design process often requires going back and forth between steps. Far from being linear, good design is iterative and subject to change" (Chevalier et al, 2021 p9). This was the case with both survey and interview questions. Survey participants were asked if climate change affected their practice of seed saving, of which over 90% answered yes, and 27% claimed it strongly influenced their practice. Similarly, when asked why growers grow and save seeds, "avoidance of corporate control" ranked as the third most important reason, after "fun and rewarding" (#1) and "self sufficiency"(#2). The relationships between these responses will be explored further in the chapter entitled "Summertime".

Another idea included in the survey which may not, on the face of it, seem related to climate change, is the relationship between seed security and sovereignty and food security and sovereignty. This has been much discussed with regards to the Global South, (Shiva, 2016; Mooney, Patel) but in the Global North we have so far been somewhat cushioned from the effects of the erosion of (seed and food) genetic diversity as it pertains to climate adaptation. This will also be further explored in the Summertime chapter, but suffice it to say for now, that all of our survey respondents saw food security and sovereignty as influenced by seed security and sovereignty, with most indicating a strong influence. Seed savers definitely understand that without seeds, food is greatly diminished. As mentioned before, even the cheese and beef we may eat comes from cows fed seeds and plants that grew from seeds. Without seeds adapted to our changing local climates, access to fresh, seasonal, traditional and local foods lessens and we have to rely more on imported and processed foods grown from the seeds that are adapted to

chemical use as mentioned by Clapp above. In the book *Seed Sovereignty, Food Security* edited by Vandana Shiva, Egziabher and Edwards claim: ”at least one facet is becoming clear – climate is changing, and a commensurate increase in crop genetic diversity is necessary for adapting to that change” (Egziabher, T.B.G. & Edwards, S. 2016. p298).

One survey respondent said it perfectly: “in my mind, you can't separate the two. Corporate control over seeds leads to control over food which reinforces a wage-type economy where people are dependent on food distribution systems; furthering human beings disconnection from the land. I'm hopeful that during the pandemic, folks were reminded how precarious and unsustainable those food systems are, and **ultimately how damaging they are to the planet** and our health” (emphasis added).

Furthermore, 90% of survey respondents claimed that climate change influenced their practice of growing. One respondent said “I never watered gardens in the past however when droughts are occurring at critical stages such as May and June during germination of many seeds, I have decided to make sure the plants have a small amount of water at important stages so they will germinate in time to finish before frost.”

Chapter 3 Summertime

3.1 Growth and Development

The Doctrine of Discovery is a sneaky beast, which means it is able to cause great harm without being caught out. It must be exposed wherever possible, since the steps to removing such a pernicious threat are threefold: recognize, then reduce and finally eradicate. This chapter strives to expose its' presence in our current times in what is known as Canada through the lens of food sovereignty, and more specifically through Seed Keeping as it contributes to food sovereignty. A brief history of Indigenous Seed Keeping on Turtle Island is described from before colonization to the present day in order to explore how the Doctrine of Discovery has impacted this key activity in the cultural lives of certain groups of Indigenous peoples and how it continues to play out in modern plant breeding of food crops.

Seeds enjoy a special place in Haudenosaunee culture. As Kahéhtoktha Janice Brant explains "When you open that husk [of maize], it's like you're looking at an infant, you're looking at a baby, you're looking at the future generations. And to me that is extremely humbling…" (Kahéhtoktha Janice Brant, 2021). Seeds are considered to be relatives: members of the family who play an essential role in providing food and who are therefore nurtured and provided for in turn. They also play a role in ceremonies for many Indigenous communities. A recent CBC article quoted Alejandro Argumedo, who is Quechua, from Peru: "Argumedo said that the preservation of specific seeds is important in Indigenous communities where rituals require the best, purest form of seed" (Mortillaro, N. 2020).

All over the world, seeds are arguably the beginning of agriculture, and perhaps therefore the origins of concepts of food security. In various places at various times, humans collected seeds from "crop wild relatives", as they are known in breeding circles, in hopes of growing those crops closer to "home" and in a controlled manner. In doing so, a relationship was forged, whereby those crops agreed to grow and feed humans in exchange for any care and propagation humans could provide. On Turtle Island, the Haudenosaunee Creation story tells of the seeds that were brought with Sky Woman when she fell from the Sky World, without which the people could not thrive: "As she fell, she held in her hands roots, seeds and plants from the Sky World" (Longboat, D. 2014 p30).

Seeds were traded north and south between peoples, who then grew them out according to the instructions that came with them. Gradually maize, as an example, made its way through time and space from the ancestral "SaraMama" in Quichua (also known as Teosinte), from South America to the Haudenosaunee in North America and the modern crop called corn, or Zea mays. Dan Longboat says: "We are 'Corn, Beans and Squash' People. They are Tyonnhehkwen 'we depend on them' and they are our sustainers" (Longboat, D.2014 p29).

Much of this, of course, was violently disrupted. Europeans, arriving on Turtle Island and planting their flags, were acting upon what has come to be called the Doctrine of Discovery:

> By the logic of the concept of 'discovery,' when the foot of an explorer made contact with soil that had not previously been settled by humans whom Europeans regarded as having a proper civilization, that soil, and all soil stretching out from

> it for as far as the metaphysical aura of discovery could be made to stretch, came under the flag of the explorer's sponsoring nation (Shorto, R., 2005).

So naturally, what did the Europeans 'discover' in that soil? In certain areas at certain times of year, they found acres and acres of crops, namely the corn, beans and squash, along with other "Sisters": sunflower, sunchoke, potato, tobacco, etc. When he arrived, Columbus himself found them growing. "In the *Life of Columbus, By His Son*, under the date of November 5, 1492, is the following note: "There was a great deal of tilled land some sowed with those roots, a sort of beans and a sort of grain they call maize, which was well tasted, baked, or dried and made into flour" (cited in Parker, 1910, p12).

Once they "discovered" maize, Europeans naturally took some back home with them, and by the 16th century it was already spreading like wildfire in Europe. "With the opening up of the New World and the discovery of the great staple grain of the western continent, maize cultivation spread with lightning rapidity throughout the eastern hemisphere. It became a definitely known and accurately described food plant" (Ibid. p11) in Europe, China and the Middle East. Haudenosaunee scholar Jane MtPleasant says:

> By the time Europeans arrived in North America, corn was the staple food crop, cultivated in extensive holdings from Québec to Florida. In the Northeast during the sixteenth through eighteenth centuries, as European explorers and military conquerors moved inland from the New England coast, they described in their journal entries the widespread production of corn by Native peoples (MtPleasant, J. 2011, p8).

Thrupp identifies that "From ancient times to the present day, plant collecting has also enhanced agrobiodiversity. Throughout the colonial period, the search for and collection of diverse plants and foods was a driving interest of European explorers and played an important role in colonial expansion" (Thrupp, 2004, p318). However it seems the

newcomers were not aware that they had "discovered" family members-in fact, even the humans living in the "New World" were not always recognized as such, let alone the Sustainers: the seeds. Europeans, it seems, had a very different concept of the nature of seeds, even though they were not yet commoditized under capitalism, and Europeans did grow and save their own seeds at that time. Grey and Patel describe the difference in relationship to land, but we can perhaps see the commonalities with seeds: "Given the kin-like relationship to land, it is more accurate to understand its commodification not as a deepening reification, but as enslavement" (Grey and Patel, 2015 p436). Although seeds were not "sold" in Europe per se, they were definitely seen as valuable to a people who struggled to feed themselves on their home soil. They were not, however, generally viewed as being related to the people who grew them, or even as living beings: plants were considered very low in the hierarchy of life and as "things", and therefore it was fair game for humans to manipulate and value them as they pleased including, eventually, as commodities.

> Agricultural derivatives are financial transactions that are linked in various ways to agricultural commodities. The trading of agricultural derivatives dates back centuries. Some of the earliest commodity exchanges include the Amsterdam Bourse, dating to the mid 1500s…Informal commodity exchanges in England date back to the 1600s, and more formalized versions of those exchanges were established in the 1700s (Clapp, 2020, pp150-151).

Regardless of how they were viewed by the people, seeds are nonetheless critical to human survival and culture and food was important in various ways in forming the earliest relationships between Indigenous people here and the would-be settlers. Indigenous peoples took pity on the starving newcomers and fed them and taught them new foodways that were functional here.

> From their first days in North America, Europeans ate Indian crops and adopted Native agricultural practices. Since corn was indigenous to the Western Hemisphere, it was unknown to the first colonists. But like millions of Native farmers before them, when introduced to corn, Euro-American farmers also found it enormously attractive and quickly added it to their agricultural repertoire. They rapidly learned to cultivate it successfully, and by the eighteenth century most colonial farmsteads grew a substantial acreage of corn for both human and animal consumption (MtPleasant, J. 2008, pp10-11).

The substantial acreage in which they planted their corn seed was land taken by various means from Indigenous peoples, justified by colonial authorities by the Doctrine of Discovery. "The Doctrine of Discovery was the legal means by which Europeans claimed rights of sovereignty, **property**, and trade in regions they allegedly discovered during the age of expansion"(emphasis added) (Reid, J. 2006, p336).

The Doctrine of Discovery justified settler armies in using food to attack and weaken Indigenous communities by destroying not only stores of seeds and food, but crops and the land itself, if those communities failed to submit to Christian/European rule.

> England and France also developed a cultural justification for discovery claims over Native peoples. They developed the principle of Terra nullius that lands that were not possessed by anyone, or which were occupied by non-Europeans but not being used in a fashion that European legal systems approved, were waste or vacant. France, England and the American colonies and the United States often used this argument because they claimed American Indians used land only for hunting and left it as wilderness (Miller, R. 2010, p8).

European-style agriculture using ploughs and horsepower to turn soil in which to plant seeds was the only "fashion" that was approved. However, this method did not work well in the sandy, rocky soils of North America.

> They learned, painfully, that European farming wisdom did not necessarily apply in America…In large part the very first Euro-Americans survived because the Amerindians gave or sold them America's native grains, or because the whites stole it…It produced far more food per acre than any plant brought from Europe (Crosby, A.W. 1994. P170).

This demonstrates the contrary nature of the Doctrine of Discovery and Terra Nulius-the land was not being used appropriately according to European custom and so that justified it's confiscation from Indigenous peoples, but as soon as Europeans figured out that their custom failed to produce food on the same land, they started using the Indigenous methods themselves to produce food-meaning that once again the land was not being used appropriately according to their own custom, but this time by themselves!

European settlers were so successful growing food on the new lands, that their population increased exponentially over the next couple of centuries. Healthy, well-fed white children grew up to take over more land, spreading quickly across the continent even as corn, bean and squash production spread across the rest of the globe. Publicly funded, government-sponsored plant collection and breeding freely mailed out seeds to farmers in Canada and the United States, and farmers saved their own farm-grown seeds well into the 1800's, when private interests gradually took over and seeds became a profitable commodity (Kloppenburg, 2004). Garden seed sales were initially unregulated, and many "new and improved" varieties were both "discovered" and "introduced" that may well have been either traditional Indigenous varieties or derivatives thereof (Ibid). With the rediscovery of Gregor Mendel's genetics work in 1900 (Ibid), plant breeding became a legitimate career for learned biologist-scientists, and the fact that Indigenous growers and peasant farmers had been actively working in relationship with plant crops (ie breeding) for thousands of years to produce every single domesticated variety in use was all but forgotten by the majority of Canadians. The new commerce of farming for profit was content to pay scientists for their breeding work by purchasing the "new and improved" varieties. Hybrid corn, which is the progeny of inbred lines of proprietary

parents (ie, seed cannot be saved), became the norm in modern farming. "Erl Bates, who directed a Cornell Cooperative Extension program for Iroquois communities from 1920 through 1964, urged Indian farmers in the 1930s to stop planting their traditional varieties in favor of the more productive ones that American farmers used" (MtPleasant, J. 2011, p14). Plant Breeders Rights (PBR) and patents soon followed, then Genetically Modified Organisms (GMO) in 1996, all of them reinforcing the colonial agenda and the Doctrine of Discovery anew, as germplasm itself became "discoverable" and therefore proprietary and manipulable for profit. As Kloppenburg explains, "Since 1925…Plant exploration became a search not for useful *plants* but for useful *genes*" (Kloppenburg, 2004 p80).

As a result of this continuation of the Doctrine of Discovery into modern times, the United Nations Declaration on the Rights of Indigenous Peoples made sure to be very clear in 4 different articles that Indigenous peoples have rights related to foods/medicines and seeds. Specifically Article 31 says: "Indigenous peoples have the right to maintain, control, protect and develop their … cultural expressions, as well as the manifestations of their sciences, technologies and cultures, including human and genetic resources, **seeds**, medicines, knowledge of the properties of fauna and flora, oral traditions…" (emphasis added UNDRIP, 2005). The document released by the Truth and Reconciliation Committee that outlines 94 Calls to Action does not specifically address food or seed, but it does call on Canada to enshrine the UNDRIP in its entirety, so indirectly this issue is included.

3.2 The Crops

The survey and interview results represent the crops growing in the fields -observations of the bounty of information shared by interviewees. All responses were kept

anonymous, because friends expressed to me that they would be reluctant to be interviewed if their names were included. In Canada, the name Percy Schmeiser is well known as the farmer who fought Monsanto all the way to the Supreme Court over the right to save seeds and lost, and while there is complexity to that story, it still strikes fear into the hearts of many seed savers, who have no wish to fight a huge corporation in court. "Let us first be clear on the crime for which Saskatchewan farmer Percy Schmeiser was found guilty. He was found guilty of (a) having Monsanto genetics on his land, and (b) not advising Monsanto to come and fetch it" (Clark, E.A. 2001 p17). Not only was Schmeiser found guilty and forced to pay damages, but "He also lost the improved genetics resulting from his lifelong practice of saving his own seed to produce his own tailor-made variety of canola, as the crop was confiscated" (Ibid). This is naturally threat enough to make many seed savers want to keep their practice somewhat secret. Pseudonyms have been used throughout this thesis.

Further, I found it useful to keep the settler responses separate from the Indigenous responses at first, followed by the themes section where the two are compared directly, to point out similarities and differences. Where possible, out of respect for the importance of storytelling, responses were kept whole, rather than dissected into bits. Interviewees were generous with stories of seeds and their relationships thereto, and this generosity is recognized and valued throughout the harvest. Chaff may have been composted, but no seeds/stories were harmed!

3.3 Adaptation

All of the settler interviewees were actively saving seeds in their home gardens, and 4 earned some income from selling seeds as well. Most, but not all, of the settler

seed saving folks I interviewed identified adaptations to climate change that they had observed in their gardens. All interviewees saved their own seeds and offered observations about how the climate had changed over the time they had been saving seeds, and how that had affected their practice of seed saving. Many identified watering as being a key change: Where previously we had enough snowmelt accumulation in the soil that seeds didn't need watering to germinate, nowadays snowmelt is significantly decreased (Hewer, M. & Gough, W. 2022). Therefore some gardeners found it necessary to irrigate seeds to speed up germination: Most found that the seeds would still germinate when the rains began again, but by then it might be too late for the crop to actually mature to a ripe seed stage before fall frost. Some seed savers found that their crops were adapting to this change and germinating despite a lack of water, but others found it necessary to adapt their own growing practices to include both watering at key times and also mulching, to keep moisture in the soil. The most recent International Panel on Climate Change (IPCC) report includes fact sheets for specific regions. The fact sheet for North America states that "droughts and earlier snowmelt runoff will increase water scarcity during the summer peak water demand period…" (IPCC, 2022). All agreed that they "believed" their crops were adapting, but that it wasn't more than a belief, due to the lack of longer-term perspective: climate change is a moving target, so the ways that plants might adapt over the long term are as yet unknown/unseen (Anderson, J. T., & Song, B. 2020). Settler growers were likely to identify adaptations that they themselves were "guiding". As one grower expressed it:

> I feel like the more obvious changes would be the ones like where I'm guiding by selection. I'm sure that things are changing in different ways. I think…the seeds are changing all the time regardless, but I think the more obvious changes are things…I'm impacting by my selection choices (anonymous informant F).

Other settler growers are content to "drop" varieties if they don't perform well, and replace them with varieties that do. One grower said of a tomato variety in which she had seen changes: "there's other varieties that I like a lot better. So mostly I don't grow it anymore" (anonymous informant L). Another said: "…we select varieties based on our growing conditions and then select which ones do the best based on our methods…in general…if they don't do well, then we won't continue to grow them" (anonymous informant P). The same grower, however, identified that their sweet peppers were maturing earlier, and that "…with lettuces, we're naturally picking ones that bolt later, so they are becoming more adapted to our heat in the summertime." It seems that if favourable adaptation happens fast enough for settler growers to observe, then those varieties are the ones that are kept and regrown. One grower referred to "informal trials" he would run, buying open-pollinated seed to try it out, and then if he liked that variety he would save seed and add it to his collection or repertoire. One gardener joyfully told me the story of a tomato variety of which a few plants survived a heavy frost that came unexpectedly one spring. As we know, the climate is not changing in a very predictable manner. While weather does tend generally to be more hot and dry, there are also sudden and unexpected frosts, intense damaging wind and rain storms, and other conditions that affect our food crops. In this case, the story goes as follows:

> So I planted those tomatoes out and I probably planted 50, on May 22, thinking the weather was gonna be just fine. I covered them with Remay and it frosted, I think the night of the 23rd, we had minus 5 [degrees Celcius] here. Of course I went out in the morning and they were all dead, basically turned to the ground, as we say, but I still had a flat left over. So, I replanted in between. I was disgusted. I was so upset. I just, I didn't pull out the old plants, I just planted in between the ones that were still in the ground and left it. That was fine. And then a few weeks later there were 3 plants out of the original 50 that started to send up shoots from the stem! And so, they had obviously survived frost and produced fruit that year!

> You couldn't tell by mid July that there was any difference between the two -- the three original plants and the new ones I had planted out. So of course I saved seed from those three and added that to the population of ones that I planted out later. So I think that's a great example of an adaptation (anonymous informant K)!

The same grower said: "So I think the plants have a lot of wisdom and past knowledge to draw upon to adapt to what's happening. And because we are planting them in the same…location every year, why wouldn't they adapt?...I believe that they're adapting."

Generally, settler seed savers also believe that their crops are adapting as they grow them (ie, in relationship with the human and their growing practices, as opposed to adaptation to the climate), but were unsure about examples of this. This is likely related to the common notion of "trueness to type" held dear by most heirloom seed savers but challenged by Landrace and Indigenous growers who value genetic diversity over uniformity and predictability. Gardeners who grow heirloom varieties tend to believe their task is to keep that variety "true" or consistent with historical descriptions of that variety; if you fail to keep the variety "true to type", then you have, literally, failed. One grower expressed that he valued variety purity when he used to grow and sell seed, but now that he is growing for his own use, that "true to type" idea no longer suits him - he has been through a process in his seed-growing development that has made him:

> ...less concerned about breed purity or variety purity, or really uniformity…I don't actually really like uniformity all that much in general…[so I like] the idea of land races, which is I think, you know, before the Victorians got their purist hands on things like seed varieties and dogs (anonymous informant F).

He identified that this makes him more likely to embrace adaptations or changes as he grows things. But, "I think certainly if you're selling something, there is a very good argument for uniformity, true to type. And even if you're giving it away, I think you have to be really clear" (anonymous informant F). Generally, settler seed savers seemed

unsure about whether their crops were adapting, but most wanted to "believe" they were. Survey results indicated that 11/19 respondents agreed that climate change affected their practice of growing seeds, but that it only affected their practice "moderately" (5/14). One survey respondent said: "over 20 years, my Italian heritage tomato has adapted to our climate: grows faster with fewer fungus problems, and I don't get plants dying anymore." A survey respondent also mentioned tomatoes:

> I've seen newer tomato varieties stabilize over time in my garden, such as indigo varieties. Saving seed from most successful fruit has resulted in better yields in successive years. I also see warm and hot weather crops do better as our growing seasons lengthen due to climate change (anonymous survey informant).

When asked about adapting their gardening practices in the survey, one grower responded: "Climate change and longer growing seasons mean I can do more successive plantings into the fall and start cool weather seeds earlier in the year" (anonymous survey respondent). Most interview respondents said that their belief in adaptation to climate change was just that: a belief, for which they had little actual evidence. Most agreed that adaptation takes time, and they did not have the opportunity to observe adaptations over a long enough time. As one gardener pointed out:

> …change is evolution really. So, you know, evolution is happening constantly, but we don't see a lot of it that quickly cuz it's very very small, generally speaking, sometimes there's big jumps, but you know, sometimes with certain things, I don't think we even see in our lifetime…the span of a gardener's life versus the span of a species life is considerably different (anonymous informant F).

The adaptations these seed savers identified most commonly were changes they were instigating themselves as gardeners, as opposed to adaptations by the plants themselves to the changes in climate. In other words, these growers see themselves as plant breeders to a certain extent-by saving seeds from the fruit and plants with characteristics they like,

they actively steer the plant variety in that direction. If the variety refuses to cooperate, then it is simply replaced by one that behaves more favourably, unless there is some nostalgic relationship to that variety-more of that to come later. In fact, while adaptation itself is well proven, the amount and time-scale of adaptation remains a mystery in scientific circles as well, so our seed savers are likely correct to be cautious. "For most cultivated plant species, it remains to be demonstrated how much genetic variation exists for these traits and what value can be delivered via commercial varieties" (Chapman, S. et al. 2012, p251). Also, more recently:

> The capacity of plants to adapt to the direct and indirect consequences of climate change will influence extinction risks, agricultural and environmental sustainability, and food security. In the face of persistent and worsening climate change, it has become crucial to investigate how natural populations and communities respond to novel environments. Several clear patterns have emerged…Despite these advances, the answers to several key eco- evolutionary questions remain elusive (Anderson, J. et al, 2020. P533).

3.4 Community

Questions were asked regarding community: do you share seeds and food in your community, do you see your seeds as community seeds, and how would you define that. Here there was a wide divergence of responses: it seems this is a complex issue for folks! One reason I wanted to ask this question is because I have a feeling that what we are dealing with here is not a "seed" in the corporate "Seed Synergy" or "Seeds Canada" (corporate lobby groups) sense. It seems to me that the seeds we are discussing here are a completely different "thing", and therefore we need a different word for this phenomenon. I had a notion that perhaps "community seed" might be an acceptable term for this phenomenon, but it turned out that interviewees had very diverse opinions on that term. Settler growers, in particular, were not in agreement on the definition and use of

"community seed". Some recent scholars are inclined to describe saved seeds as "biocultural heritage" (Swiderska et al. 2009, 2018, 2022) because they are not just material objects: "Seeds embody knowledge, practices and beliefs, inextricably linking biodiversity and intangible cultural heritage…" (Swiderska, K. et al, 2022. P60). The word community is used in the definition of "biocultural heritage" as follows: "Knowledge, innovations and practices of Indigenous peoples and local communities, that are collectively held and inextricably linked to traditional resources and territories, local economies, the diversity of genes, species and ecosystems, cultural and spiritual values, and customary laws, shaped within the socio-ecological context of communities" (Swiderska et al., 2009). Settler seed savers recognize the "intangible" aspect of seeds, in that they mostly agree that seeds are living beings, and credit them with "memory", "knowledge" and the ability to be "in relationship". But perhaps because they are not generally part of the settlers' own cultural heritage (settlers tend to grow crops from all over the world, as long as they grow well in this climate), the seeds are not always recognized as belonging to the settlers' "community". One grower said: "I tend to view them more as ancestral possessions…" (anonymous informant F). Another described the complexity as follows: "The seeds are for the community, but…it's our collection. It's open-pollinated and…we provide people tips on how to grow their own seeds. So in that sense, our seeds are community because anybody could take them and grow it [on] their own" (anonymous informant P). Another grower indicated that seeds grown by a community organization (in this case the non-profit "KASSI-Kingston Area Seed System Initiative") would be community seeds more broadly, but the seeds she saved from her garden are "community seeds within the very small community, but not...the whole local

community" (anonymous informant L). At this point I have to stop and acknowledge my own positionality on this point. Intellectually, I believe that seeds are living beings with whom I have a relationship. But as I write these words, I can look up at a jar of Arugula seeds sitting on the shelf in front of me-and do I truly see them as my community? Do I, deep in my consciousness, see them as living beings about whom I care and who care for me? As Timothy Morton reminds me:

> Just think about the long history of sexism or racism: they have affected our behaviour in all kinds of ways we may not be aware of-and it has taken a lot of time and effort from a lot of different people to make obvious the types of patterns of thought, assumptions and behaviour that underlie prejudice and even make people think it's OK (Morton, 2018. p7).

Am I, similarly, speciesist? How does this affect my patterns of thought, assumptions and (from those thoughts and assumptions) behaviour? Again, what exactly, are we talking about? Is a seed just a seed, after all? Something that can be patented, owned, collected and then lost again? While most settlers did agree that seeds were living beings, and some specifically said they didn't believe they could be "owned" as such, they also behaved in ways that were somewhat cavalier towards the seeds-indicating that they were less invested in their seed relationships than in their human ones. Then again, perhaps the relationship is similar to relationships we have on social media: we know the other person is human, and intellectually we know they need and deserve love as much as we do, but if we don't like what they post we will still "unfriend" or block them without much hesitation. Paul Robbins (along with others) has shown fairly conclusively that: "Awareness of consequences weights lightly in individual decision-making relative to the normative power of the community. It is not so much that community norms are vanishing (with unwanted ecological effects), as they are instead being remade into new

persistent relationships" (Robbins, 2007. P131). In this case, awareness of the fact that seed varieties are frequently being lost/going extinct and that seeds are living beings who, presumably, don't deserve to be lost or go extinct "weighs lightly" for settler seed savers relative to the "normative power" of seeds as commodities bought at the store.

> The idea that agriculture is life-nurturing, and that crops and seeds are entities interdependent with humans, prevails in many cultures and regions. Humans care for and nourish crops and are in turn nourished by them. In some sense, crops and humans become mutually caring partners… (Nishikawa, Y. 2022. P 196).

This sounds to me, like a valid definition of "community". But settler growers disagree on this point. An illustration of this could be found in the different responses of the two non-profit organizations who were offered the Heirloom Seed Sanctuary seed collection when the time came to pass it along. The KASSI group made the difficult decision to divide the collection. They felt they had to be "realistic" about how many seed varieties they could maintain, and that they therefore had to decline some of the varieties from the collection -- mostly the ones most difficult to maintain, such as the biennials and the most aggressive out-crossers that require large populations. Ratinenhayénthos, on the other hand, saw the seeds as a community that had been together for many decades, and that included myself, the grower. They therefore made the decision to take all of us together, all the seed varieties and myself, come hell or high water, so that we could build relationship with the new land together as a community. They chose to have faith that the resources would appear from having made this difficult decision to be in right relationship, with a "good mind" as required by Haudenosaunee spiritual tradition. More will be said on this in the Summer Crop-Tyendinaga section. Again, the relevance of this question to the context of climate change is that commercial seeds -- seeds grown for the purpose of sale in the free market are not likely to be grown with any thought of

adaptation or resilience. They are grown in large populations, yes, but they are intensively fertilized, watered, and protected in various ways from the vagaries of "pests" and the weather, solely for the purpose of producing a large quantity of the cheapest possible "product". I wished to find a term for seeds grown within local communities, where growers are actively observing whether and how their crops are adapting, and where food security and sovereignty are the goals of seed production, rather than profits. It seems to me that it would help with regulatory and policy issues if such seed could be designated differently. Settler growers did not necessarily claim the seed they grew themselves as "community seed", but they did believe that there should be publicly funded organizations stewarding seeds.

> I think that there should be, I mean there are, and I think they should be supported and ideally grow…like community seed banks, and community seed resources…but community held assets can be very challenging to manage. Because it's almost always on a volunteer basis and there's always volunteer burn-out and people ebb and flow and that's fine…I feel that there should…be regional community seed banks that actually someone's paid to manage. So they do it consistently and they do a good job. Just like we have other community assets be they like parks, recreation areas, historic house museums…you know, the docents are paid, they have expectations they have to meet, they show up, things are accessible. It just makes for better long term plan[ning] (anonymous informant F).

As mentioned before, others believed KASSI as a community seed organization held community seeds, as opposed to themselves as growers, who did not necessarily steward community seeds. Other community groups and events were also mentioned by multiple interviewees, such as Seedy Saturday, "school programs", the EFAO (Ecological Farmers Association of Ontario) and community gardens: donations of seed to these causes ***was*** seen as part of the response to the question about community seeds. One grower who

does sell seeds explained the "tension" they feel between feeling that "all seed is community seed", on the one hand, but still:

> I need to have them be sold commercially to make a living, but that's what I've chosen to do…I try to approach the work of seed growing and seed sharing and seed selling through that community lens, and that translates to…not just the seeds themselves, but also what we do with the income that we get from the seed. Like, do we share that? Do we make sure some of that goes back into the community and to community efforts and also, you know, approaching the…seed system and the seed world that we're in with a community mind frame…how can we all work together to…get more people involved…get more community involved (anonymous informant A).

Although settler growers tended to drop varieties if they didn't perform well, exceptions to this include family seed passed down - which is generally kept and regrown if only for nostalgia, and which may be an exception to the community rule. Perhaps settlers who have been fortunate enough to inherit family seeds do see those as family or community members, and as such are less likely to drop them. Very few settlers mentioned this scenario, but one told the story of a tomato variety that was given to her by an aunt.

> I got all those seeds from you guys in, I think 2008, but…my aunt, who is my country aunt, she gave me some seeds of tomato plants that had been grown…on our family farm for a couple decades beforehand. So they were just Bonny Best [name of the variety] seeds, but..she gave me those. So I was growing those and saving those. And then when I got the collection, there was Bonny Best in there too, but they were a little bit different. My aunts were a bit smaller and a little bit sweeter. So I…called those "Aunt Jean Bonny Best". Just so I can differentiate between the two of them (anonymous informant B).

3.5 Tyendinaga

For the reasons previously discussed, interviews in Tyendinaga were challenging. In the end I was only able to interview the 8 people directly involved in the board and staff of Ratinenhayénthos, and although they are all supportive of seed keeping through

Ratinenhayénthos, not all of those people actively grow their own seeds. However, at least one participant who claimed not to save seeds, discovered through the course of the interview that, in fact, he does already save seeds, he just hadn't thought of it that way! This strongly influenced the responses to the questions, due to a lack of practical experience on the part of some interviewees.

Of the eight interviewees, 5 confirmed that they did save seeds and one said "I have, in a sense, grown my own seeds, though I never really knew that that's a thing" (anonymous informant S). One claimed he did not save seeds, but then went on to describe various processes by which he had actually saved several types of seeds, and one respondent had definitely not grown or saved seeds, but indicated that "…it is a goal. It's just not happening right at the moment" (anonymous informant C).

Haudenosaunee culture includes a centuries-long tradition of seed keeping, particularly of the "3 Sisters" -- the corn, beans and squash -- but other crops as well (Parker, 1910; MtPleasant, J. 2011). As noted previously, seeds were traded amongst Indigenous peoples throughout what is now known as Central and North America, or Turtle Island. However, more recently seed saving has become increasingly rare, and, similar to the settler community, most people learn the skill as adults because they don't have mentors available in families anymore. Of the 11 respondents to the survey in Tyendinaga, only 2 had been saving seeds all their lives, one person said 15 years, while 8 respondents had been saving seeds for 6 years or less (10 identified their age range as adult-30-65 years, and one identified as a youth, age 15-29). The most common reasons for saving seeds were "saving money", "fun and rewarding" and "self sufficiency", but given the opportunity to offer comments on their answers, some identified further reasons they

saved seeds, including 3 responses indicating a "Cultural connection/spirituality"; "It is definitely a way to connect on a deeper level with our foods", and "Growing and saving seeds is helping me to reconnect to culture, learning from our ancestors by learning from the seeds and the plants. Growing provides me with the opportunity to talk with my children about our relationships with the natural world, and our responsibilities to our non-human relatives".

Interestingly, respondents from Tyendinaga were much more consistent in their responses on the definition of "community seeds". Only one said they weren't sure how to define "community seeds", and, similar to the settler folks, corelated community seeds with a community organization: Ratinenhayénthos/KSSLC. Everyone else defined community seeds as those traditionally grown "with, by and for the community" (anonymous survey informant) Others expressed this as: "grown locally and shared with others" "grown and shared by community members" "seeds grown year after year that are deemed important to the community's self-sustainability", "seeds that originate or are grown in our community" "seeds with a community connection/story", and "our traditional indigenous varieties of seeds". One respondent added an element of recognition by others: "Any seeds developed by a community member or grown for generations in that community, and that the community has become aware of to even a small degree, and that the community is known for by other communities, even if just a few other communities."

Regarding climate change, most growers who responded to the survey indicated that climate change influenced their practice of growing seeds, and some indicated a "strong influence". However, they seem to agree that it is their own practice that is

changing, rather than the crops adapting. "I haven't noticed an immense change in crops related to climate change. I definitely think that there has been some change in fruition where the plant does not or can't reach maturity no matter the support it gets. I sometimes wonder if that is due to the shift in growing season that seems to slowly be happening." Others mentioned that they now water their crops much more than in the past. "It requires daily watering to ensure the plants survive. Years ago my garden was self-sufficient and required watering once per week." Water was identified as an issue by interviewees as well. For example, one noted:

> I believe that climate is definitely affecting them. Cuz last year, when I planted all my different bean varieties, I had to water the seed to get it to grow, which I've never, ever done. In 20-some-odd years of growing anything to actually have to water what I planted…in May and June…So I don't know if the beans have really adapted yet (Anonymous informant J).

Another described her father's experience growing his traditional beans.

> I don't know how well they're adapting. So I'm gonna talk specifically about potato beans, because we've had a lot of struggles with those over the last few years and we think it's climate related…but obviously we don't know a hundred percent for sure. We've noticed that…when they sprout and they come out of the ground, the leaves are sometimes already brown, which is weird, it's strange. But it's happened consistently with the ones that my dad's grown and the ones that grandma and I grew in our little garden box. So…I feel like it's really struggling right now. And my dad thinks that it's just like, there's not enough moisture in the soil. He sowed a first crop of them and they came up and their starter leaves weren't fully developed or something. And they were brown and…just, they weren't healthy obviously. So they didn't make it. So then he did a second sowing and he spent more time watering them…and they all came up…with fully developed leaves this time. So we think it's related to that…and we've personally noticed that our seasons…we've had these hot, dry periods early in the summer that haven't historically been there…and…the nighttime temperatures have been cooler than average as well…we didn't get a lot of germination just I think because of the cold nights. So…the potato beans I feel are struggling to adapt (anonymous informant E).

Interestingly, people seem to be willing to adjust their growing methods to keep the crops going -- certain varieties are not to be "dropped". Unlike the settler growers who will let varieties go if they fail to produce well in their growing system, Indigenous growers are committed to their varieties and are willing to put the time and effort in to keeping them viable over the long term. This likely harkens back to the belief that those "community seeds" are members of the family, and part of the cultural fabric that is handed down through generations. Certain traditional varieties are included in ceremonies, stories and important shared food dishes -- that just wouldn't be the same without those specific varieties. The names "Dwayne Baptiste bean", "Deseronto Potato bean", "White Flour corn" and others were mentioned by multiple interviewees. These varieties will be helped along in their adaptation to climate changes, because the community is committed to them-they are irreplaceable. At the same time, growers did not seem worried about them; there appears to be a difference in time-scale for Indigenous growers, in that they know these varieties have already adapted, along with the people, for many years, so the idea that they will continue to feed people for many more years into the future is not in question. Yes, Indigenous growers recognize that the climate is changing and challenging the seeds, but, as one grower expressed it: "they've been in reciprocal relationship with us for a long time" (anonymous interviewee N). The same grower went on to describe how these are community seeds:

> I would consider the seeds that we hold to be community seeds because you know, they're not purchased…they're seeds that we've gathered from different people, that we've been gifted, that we've traded. I would definitely consider them to be community and..a lot of them are our ancestral seeds you know, …like they're seeds that have been passed down for generations…how can anybody claim them? They're their own beings really (anonymous informant N).

Internationally, Indigenous knowledge and crops are gaining recognition for their adaptive wisdom in the face of climate change, as highlighted in a 2011 IIED report. Partly this is due to the phenomenon that Watts describes:

> However, if we accept the idea that all living things contain spirit, then this extends beyond complex structures within an ecosystem. It means that non-human beings choose how they reside, interact and develop relationships with other non-humans. So, all elements of nature possess agency, and this agency is not limited to innate action or causal relationships (Watts, V. 2013. P 23).

This means that Indigenous people's role in "monitoring, adaptation and mitigation" (IIED. 2011) is perhaps one of interpreting, or translating the non-human agency to the human. Tyendinaga seed savers are not worried about the adaptation of their crops to the changing climate, they are simply watching as the agency of those crops unfolds and interacts with other non-human elements -- witnessing to the challenges, monitoring them and occasionally mitigating them (by watering, perhaps) as part of the longstanding respectful relationship between them. Traditionally, the maize is planted when the oak leaves are the size of squirrel's ears; there is a relationship between the oak and the maize and the people (and, of course, the soil, water, etc). Perhaps the relationship is changing such that the maize should not be planted until the oak leaves are the size of racoon ears- the people caring for maize must watch and learn. Also, maize is traditionally planted during the waxing moon, indicating the relationship between the maize and the moon, but perhaps this is changing as well, due to interactions of the moon with soil water availability (the moon has a relationship with water on earth, and clearly water is one of the key "limiting factors" for growers). I have also heard that maize can be planted when the wild plum is blooming, but certainly this past season (2022) in Tyendinaga, the wild plum blooming was not aligned with the squirrel-ear-size oak leaves, or with the waxing

moon phase, so the planting of the maize was perhaps a bit late. But the maize failed to germinate anyway until AFTER a late spring tornado had passed through and I am willing to have faith that those plants knew something was coming and exercised their agency to grow at the appropriate time; I have seen similar phenomena occur before. Some might call this superstition, but as Gary Holthaus says:

> Our [settler] culture is as fiercely superstitious about the economy and political and military power as any indigenous culture is about Ground Squirrel and Bear. I will trade in my culture's worldview filled with the superstitions that demonstrate our respect for accumulated goods, wealth, and power above all else. The superstitions of an indigenous worldview that respects all life and engages in rigorous self-cultivation and study, the goals of which are wisdom and survival of the people, seem like a good swap. The former choice— putting my faith in our current system—means I have a ticket on another Titanic, soon to go down in its own selfish acquisitiveness (Holthaus, G. 2008. p 215).

Speaking of the economy, there is another interesting difference between the Settler responses and the Indigenous ones. Asked if the seeds were "shared in the community, and if so how-are they gifts, are they for neighbours or family", many responded that they would trade the seeds. "We exchange usually, cuz that's kind of our cultural way to do things too…Whether it's a $20 bill or whether it's meat or whatever, it's that reciprocity" (anonymous informant J). Some indicated that they had experienced gifting seeds, only to find they were later being sold by a seed company: "they take one of our traditional varieties and a seed company has taken it on as their own. And…I'm thinking, well, they shouldn't be doing that because that's not theirs to take over" (Ibid). Another grower said she makes sure to trade seeds in a specific way:

> Number one, I reserve certain seeds for trading with our…traditional seed network…of seed growers, because some of those people gifted me seeds. Right. And that's how come I have those seeds anyway, so I feel a great sense of respect and honour to give them back. Like, it's a responsibility, and so that is a priority for us…to return a certain amount of that seed to be shared amongst some of that network and also to their networks…that is a community that I prioritized because

> those people are actually usually working on the preservation and continuation of those foods for the future and for our ceremonies and to keep our culture alive because a lot of our culture is tied to the foods and seeds (anonymous informant G).

She also gives seeds "to…friends and family and people that show a genuine interest in certain varieties…and maybe are already learning seed saving practices. Those are the kind of people I like to gift to because it makes me feel like no matter what happens to me or those seeds that they'll continue on somewhere" (Ibid). The same interviewee went on to describe her responsibility.

> They say that in the sky world, before we come, that we choose our family. And I must have chosen this family to keep learning about these things and to keep building upon those understandings and to be someone that helps so that these seeds will continue on…it's not something you can just walk away from." In fact, "I kept thinking that maybe I could have a different life without gardening and without seed keeping, but it kept calling me back…I always bring seed keeping and indigenous culture into whatever I was doing because that's just who I am and it has so much to offer (anonymous interviewee G).

3.6 Obstacles

Interestingly, the obstacles mentioned by both settlers and Indigenous respondents were basically the same. Lack of knowledge, lack of time and lack of land were all concerns for both groups. Most identified that in their pasts, they just didn't think about seeds at all. They took it for granted that seeds were bought at the store, and never questioned how they got there, how they were grown or where. However, a couple of respondents from Tyendinaga did identify the role that trauma has played in that dynamic for them. One younger grower said it was about

> healing our trauma. Right…I think that's what it boils down to for native people specifically…we can't keep living like this and we know we have all this trauma and we know it's like blood memory and that kind of thing…and if we want it to be different, then we have to make a choice of either just continue to do what we

> know…or do things in a healthier way. And so I think like gardening and caring about where our food comes from and all those kinds of things…they're all helping to change the minds of people and be more self-sufficient…if people had the opportunity to eat their, our traditional foods…it would make a huge difference in their understanding and their ability to open their mind to those things. Because I think that's kind of one of the underlying issues in why they don't think that way is because we've just been trained to have a closed mind about things (anonymous informant H).

She went on to state her belief that:

> people would be much more fulfilled in their lives if they understood that seeds are them and they are seeds and everything kind of comes back to that. And…I just think that there's a really deep level of identity that kind of connects those two pieces together in that it's very freeing once you're able to realize it…it just really changes your way of how you view yourself…for the better (anonymous informant H).

Another younger grower also brought up the issue of health: "one thing…[is] just physical ability, you know, for seniors or people with disabilities or chronic illness, it's a lot of physical labour to get out in the garden and till and plant and weed and harvest and all those things" (anonymous interviewee E). This is likely similar to the comment above about the effects of trauma and the separation from traditional foods which is known to have health consequences. The book *Settler* notes:

> All of which is to say that historical attempts at assimilating Indigenous peoples through education, removal of status, relocation, and enforced socio-economic change [such as diet, perhaps] have not been successful, though the toll these imposed systems have taken on Indigenous societies is enormous (Lowman and Barker, 2015. P81).

I believe this toll includes physical health. The young seed grower further identified that, particularly for youth, "there's so many competing things, you know, like there's so many more exciting things that are vying for their attention…events and social media and friends and stuff" (anonymous informant E). One important obstacle for Indigenous seedwork on Turtle Island more broadly that was brought up by one seed grower in

Tyendinaga was the international border between Canada and the United States. For Haudenosaunee folks, Onandaga is the capital, but it lies on the other side of the current political border. She said "we have treaties like the Jay treaty that is supposed to allow us to trade goods to our own nations." But often:

> we could not even get our own seeds across the border without molestation and acts of violence towards us…me and K lost a huge amount of seed…they took the seeds out, but then delivered the [empty] box to show us, this is how we're gonna treat you. Those were some of the most treasured seeds because they were supposed to go to the capital, which is Onandaga for us, and they were supposed to help with their seed work too…And so we actually laid out a plan for how seeds will cross the border in the future, they will be delivered by a person so that it can't be intervened like that. Or at least if they get stopped, we can call the chiefs. And let them know that the Jay treaty is being broken again (anonymous informant G).

She said, "there should be repercussions cuz they're breaking the treaties all the time, not us-them!" (anonymous informant G).

Initially I was reluctant to include questions about obstacles to saving seeds. It seemed that the obstacles were the obvious ones, as stated by the settler group: lack of knowledge, resources and land. Fortunately, Ratinenhayénthos asked that there be questions included about obstacles, and particularly obstacles for young people. Sure enough, there are actually more obstacles to saving seeds for Indigenous folks than there are for settlers, even though the stakes – the risk of losing not just "things" but relationships -- are higher.

Chapter 4 Autumn

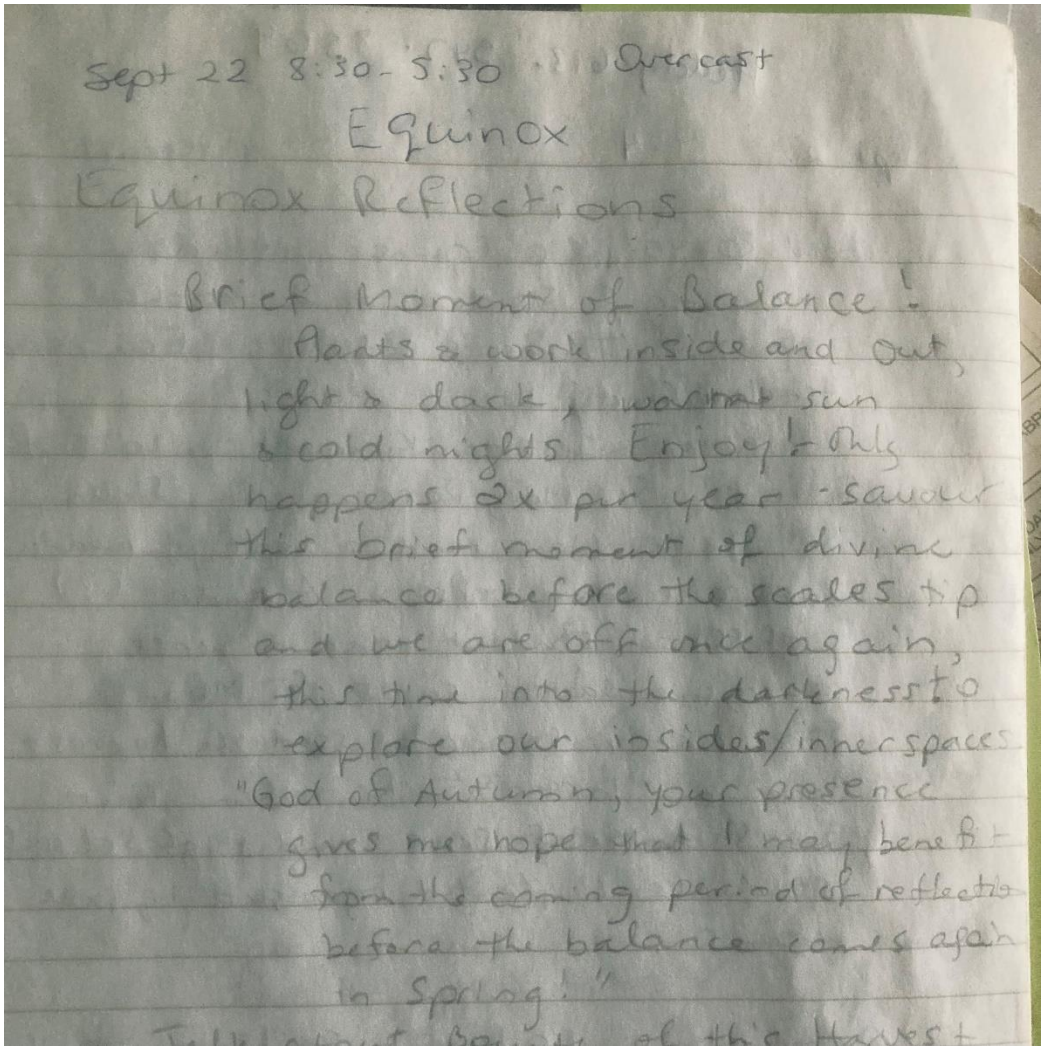

Sept 22 8:30 - 5:30 Overcast
Equinox
Equinox Reflections
Brief Moment of Balance!
Plants work inside and out,
light & dark, warmth sun
& cold nights. Enjoy! Only
happens 2x per year - savour
this brief moment of divine
balance before the scales tip
and we are off once again,
this time into the darkness to
explore our insides/innerspaces
"God of Autumn, your presence
gives me hope that I may benefit
from the coming period of reflectio
before the balance comes again
in Spring!"

Figure 4 Autumn Equinox Reflection from HSS notebook, 2010

4.1 The Harvest

We don't typically plant seeds and then walk away, never to return. Instead, we plant seeds, care for the crop, and come back often in autumn to reap the harvest, to gather what we need to sustain us for another season (and hopefully longer). Autumn is also the time to separate the wheat from the chaff, so to speak. Not all the information shared is relevant to our goal of understanding how seed keeping contributes to food security in a time of climate change, or more practically, how seed saving knowledge can be shared

further and wider, so that more people can engage in a relationship with seeds that helps secure our future healthy food supply. When one is saving bean seeds, one removes the beans from their pods and sorts them into three piles, all of which are valuable: one pile for top-notch whole seeds for saving to grow next years' crop, one pile for seeds that are edible, but perhaps not "top notch", nutritious and filling for winter soups and stews, and finally one pile of moldy seeds that are destined for composting or feeding to chickens. Similarly, this research can be organized into "piles" - or "themes", if you like. These themes cut across the questions and are worth exploring further. They are: (1) "Decolonization", (2) "Gender in Seed Saving", and (3) "Adaptation of plant and practice".

4.2 Theme 1: Decolonization

While saving seeds is, in itself, an important activity, and one that connects humans to nature in a very practical way, it does run the risk of being a colonial activity. For settlers, who do not recognize saved seeds as their own family ancestors, it is apparently very easy to grow a particular crop for a few years and then stop because it doesn't suit them anymore. This way of saving seeds is somewhat extractive, since most open pollinated seeds are, in fact, the biocultural heritage of someone, likely Indigenous, somewhere in the world. Perhaps settlers in particular would do well to give some thought to the origin of the seeds they are growing, and to investigate how they are related to them: if they are part of the settlers' own biocultural heritage or not. It may be a good idea to develop protocols around seed growing, so that there is agreement up front about who is growing what, why and for how long. Where did it come from, and where will it go if the seed saver decides it is no longer appropriate for them? Seed registries are

controversial, but perhaps there is a place for some type of (free, accessible) registry in this case, so that Indigenous groups can reclaim and rematriate certain seed crops from a commercialized line, from seed companies, or from home seed savers who have fresh seed they no longer wish to grow. This theme emerged from the interviews for me very strongly, as I went through them in a parallel fashion, Indigenous interviews alongside the settler ones. It reminded me very much of the Kaswéntha -- the Two Row Wampum -- in which Indigenous folks paddle their canoe on the same river, alongside the ship of the Newcomers: separate and not interfering with each other, but still side by side. This is not to say that settlers should not be growing seeds that are Indigenous to here at all -- there is a way to work together, of course. It just needs to be done in a way that is respectful and not re-colonizing: not just a continuation of the colonial project as it has played out on Turtle Island.

There has recently been yet another mega-merger in the seed sector, between Monsanto and Bayer Crop Science, bringing the control of the seed market globally into just 4 corporate actors, from 6. Rowen White is a vocal Haudenosaunee seed keeper and a prolific writer who references this:

> "This global corporate merger is a reflection of the nature of the larger industrial food complex… the reality of corporate seed takeover is a symptom of a much larger cultural syndrome. It is a symptom of what happens when we abdicate our relationship to our seeds to others. Don't get me wrong, many of us, indigenous and farming people from around the globe didn't just complacently give up our rights to care and steward our ancestral seeds…no it has been a violent transition, people robbed of their rights by large corporate campaigns to disconnect people from their seeds, or manipulated into thinking that progressive change to new hybrid varieties will ease the workload or increase the yield. **The colonization inherent in this cancer of the global industrial food takeover is a staggering force which to this day continues to disrupt and sever time-honored relationships to seeds and ancestral lands."** Emphasis added. (White, R. 2018. Paragraph 8)

I believe she is describing how seed saving (or lack thereof) is a wicked problem within a wicked problem-that of capitalism/oligopoly. Indigenous and farming people from around the globe have been deskilled and disconnected/"manipulated".

In discussing his "Decolonizing Diet Project", which is a research project out of the University of Michigan, Dr. Martin Reinhardt says in a podcast: "The act of decolonizing is trying to become healthier in the land that you're in" (Reinhardt, M. 2022. 26:35). Participants in his research project ate a diet composed of foods that would have been eaten on Turtle Island before 1600, before Europeans arrived. They had full doctor check-ups before and after the project as well as regular monthly check-ups throughout. All participants, both Indigenous and settler, showed improvements in their health across a range of indicators, leading Dr. Reinhardt to conclude that "the healthiest way that we can eat as human beings is locally and Indigenously"(Ibid. 28:33). He also described the phenomenon I found in my interviews: that Indigenous folks felt a deep spiritual connection to the foods and felt it was a deeply healing experience to eat this way, whereas the settler folks did not describe this experience (Reinhardt, 2022. 23-24). Indigenous seed keepers I interviewed often mentioned seed saving as a spiritual connection and as a healing practice of connection with the land. Perhaps it would be beneficial for settlers to open to the same experience - whether by committing to grow seeds from here, or by finding seeds from their respective ancestry to grow here. Dr. Reinhardt offers a course through the university called "Decolonizing with Indigenous Food". He mentioned that "it has to come with an ethic", perhaps meaning there must be boundaries so that "Indigenous Food" doesn't become a catchy trend to make profit for somebody and make white folks feel better. This is what I believe is applicable to our

seed saving practice -- there has to be an ethic. It has to be about us all becoming healthier/more ethical "in the land that you're in"(Ibid). This, to me, suggests cultivating and acknowledging that we exist in relationship with the seeds and land. As one interviewee said, "…from a very Indigenous place of understanding that everything is in relationship with everything all of the time…developing relationship with seeds has been pivotal for me because you care about those seeds, the way you care about your freaking kids!" She elaborated:

> I think that's an important thing for us to remember is that there are community seeds, you know, whosever community they may be from…And we have to treat them like relatives, the way we would treat people from those communities. You know…when we have a guest over, we give them the best of everything. Like we give them the best food and the best bed in the house and the best chair to sit in and all those things…And so we have to do the same thing for our seed relatives and give them the best…it fills your soul up (anonymous informant N).

A young seed keeper said: "I think that people would be much happier and people would be much more fulfilled in their lives if they understood that seeds are them and they are seeds and everything kind of comes back to that."(anonymous informant H) Another pointed out: "they've been in reciprocal relationship with us for a long time." (anonymous informant N). In a recent blog post, the Indigenous Land Stewardship Circle discussed how climate change/environmental stewardship and decolonization go hand-in-hand locally, via relationships.

> We are conserving places that matter to our cultures and to the health of the larger world. Indigenous Protected and Conserved Areas help us be who we are: caribou people conserve caribou ranges. Salmon people protect salmon watersheds. They reflect our laws and traditions. And they ensure Indigenous Peoples can maintain our relationship with these lands (Indigenous Land Stewardship Circle, 2020).

Perhaps this strategy for maintaining lands could be useful in protecting and maintaining relationships with seeds as well. Grey and Patel examine food sovereignty in a similar light:

> While 'sovereignty' always entails jurisdiction, we illustrate how some Indigenous movements deploy a unique understanding of the term. The usage we are most interested in involves the relationship between a physical territoriality and a kincentric universe that both challenges and enriches the broad ideas that coalesce under the mantle of 'food sovereignty.' Further, this rootedness consciously operates as part of a much longer history of resistance to the colonization of Indigenous space and place. To address Indigenous concerns, then, we assert that the politics of the wider food sovereignty movement is obliged to expand beyond the familiar bundle of rights that attach to production and consumption, since the resurrection of Indigenous traditional foods and food systems is inextricable from a more general Indigenous cultural, social, and political resurgence. An examination of food sovereignty alongside Indigenous struggles thus reveals a key theme: that food sovereignty is the continuation of anti-colonial struggles in ostensibly postcolonial contexts (Grey and Patel, 2014. Pp 432-3).

It is this "inextricable" nature -- the nature of relationship -- that points to decolonization as it must happen. Seed saving must likewise be "the continuation of anti-colonial struggles in ostensibly post-colonial contexts" (Ibid). The title of this work is "More than Food", indicating that seeds are indeed part of this larger web of relationships. One interviewee, a long-time seed keeper, expressed her feelings: "I just felt so lucky because it wasn't just food. It was medicine, it was medicine for our souls, for our spirit, for the land itself, and even for people that were touched by what we were doing…" (anonymous informant G)

Robin Wall Kimmerer discusses saving seeds of ash trees, since the Emerald Ash Borer pest is close to killing all ash locally. When the Ash Borer has died off due to lack of food, the seeds can be planted to regenerate the Ash population:

> to replant the forest after the wave of invasion has passed…Many of our traditional teachings recognize that certain species are our helpers and guides.

> The original Instructions remind us that we must return the favor. It is an honor to be the guardian of another species-an honor within each person's reach that we too often forget (Wall Kimmerer, 2013. P151).

There are now a few lovely "how-to" books on saving seeds (Ashworth, Stickland, Gough & Moore-Gough, Seeds of Diversity, Seed Savers Exchange, Navazio, Ray, Warnock and most recently Ulager) but perhaps we need one that begins with those words: "It is an honour to be the guardian of another species, do not forget this!" Settler seed savers can learn about and then not forget the Treaties and the relationships that still exist. If our interviewees are any indication, this will enrich our lives and bring healing. Through deep connection comes deep reward. And the connection is already there, we just have to acknowledge it and respect it! This is what decolonization can be for seed savers. We have the potential to meet climate change AND colonization head-on. As our interviewee said above: "It fills your soul up".

4.3 Theme 2: Gender and Seed Saving

If we are to encourage seed saving practice, it's important to recognize who is likely to do it:

> Empirical research suggests that women are more likely than men to support environmental protection. Various strands of feminist theory suggest that this is due to women's traditional roles as caregivers, subsistence food producers, water and fuelwood collectors, and reproducers of human life. Other theorists argue that women's status and environmental protection are linked because the exploitation of women and the exploitation of nature are interconnected processes …there is mounting theoretical and empirical evidence indicating that greater gender equality may be connected with better environmental stewardship (Ergas et al. 2012. P 965-966).

A theme that emerged very clearly from this research is the important role gender plays in seed saving. In Haudenosaunee culture, women are traditionally the seed keepers. This has been the case for hundreds of years; their role is well known and well documented. As Kahontakwas Diane Longboat says, "The sacred role of Woman as Life Giver and Life Bearer is clear. Singing the land to life with song and the gentle patting of feet as Sky Woman did is still practiced in most traditional Indigenous societies as women plant in the spring" (Longboat, 2013, pp39-40). In Tyendinaga the survey we did included certain demographic questions at the request of Ratinenhayénthos because they believed it would be helpful in future funding applications. So, we did ask for age ranges and gender. Of the survey respondents, one person declined to disclose their gender, but all the rest identified as women (10/11).

Many of the Haudenosaunee seed keepers from Tyendinaga commented on this role. One interviewee said of the seeds: "They're like your children or like your family and you wanna protect them and care for them and you don't wanna be absent for long periods because things can go wrong" (anonymous informant G) and even though the gender balance of interviewees from Tyendinaga was very good, almost equal, the women were all saving seeds, whereas the men who responded to the interviews were not all saving seeds at that time. All had the wish to do so and were supporting the seed keepers by being on the board of Ratinenhayénthos, but two were not active in that role at this time. Women's roles have traditionally been related to the home, providing food, cooking food provided by hunting and also growing food on site, preparing it and making it edible for the whole family, so perhaps it makes sense that seeds would be saved by the women, since they are predominantly grown in gardens and since many seeds are extracted at the

time of cooking, so as the vegetable is being prepared for cooking, the seeds are often taken out and cleaned, or processed to some degree for saving, and then dried to keep for successive years. In some cases, the seed is the food itself, such as the kernels of corn. And in this case, someone has to take care that not all the seeds are eaten -- that some seeds are kept back for successive plantings, and generally there is some selection that happens at that time, such that the best kernels for eating are eaten, whereas the best ones for seed are kept back. Some knowledge and experience is required to be able to discern which is which. Traditionally it has been women who do this job because it is done in relation to cooking the food.

This will not be uniform across all cultures, of course, but interestingly most of the settler interviewees were women. Of the settler seed savers who were asked for interviews, there were only five men that met the criteria for interviewing, and of those three declined to be interviewed. One said that he was no longer saving seeds, one declined for unknown reasons and one didn't respond. So, of 12 actual interviewees, only two were men. Perhaps even in our modern day settler culture, women still feel more onus to provide the food for the household and to carry on that traditional knowledge. The settler seed savers did not discuss gender per se, but at least one of them had seeds that they were saving seed from a previous generation in the family, who happened to be a woman -- an aunt, in this instance ("Aunt Jean's Bonny Best").

Another interesting coincidence is that of the varieties that were named by settlers as varieties that they had in their collections, that they were saving, many of those had women's names -- they were named after women. This could be another whole study, as to how seed varieties get their names, and what meaning that has: if there is indeed a

gender disparity in seed variety names. I suspect we would find that there are more varieties named after women than men. In the HSS collection, of the varieties that carried people's names, I am aware that many of them carried women's names such as "Ireland Creek Annie" bean, "Jeannette Urban" tomato, and "Caroline" lettuce.

If we are to encourage seed saving in the future, I think it is important to take note of this strong bias in favour of women because it will perhaps be women to whom we need to appeal initially/first. Perhaps it will be women who are more open to this type of activity and would naturally value it and pursue it. Vandana Shiva writes about women in the vanguard of food security: "Women are not just sowing the seeds of resistance against an agriculture based on monocultures and corporate monopolies; they are sowing the seeds of alternative paradigms of science and alternative agricultural practice" (Shiva, 2016. P xix). In Peru, "Women's leadership has turned out to be an important initiative developed by ANPS [Association Nacional de Productores Ecologicos] as women farmers are genetic resources conservationists, handle their agro-biodiverisity, and are responsible for seeds at the family and community level" (Flores, P. 2016. P 341-2). In Canada, a recent study on food insecurity identified: "The household is a principal site of food politics where personal, interpersonal, and broader structural dynamics play out. Indeed, questions regarding ways to plan for, acquire, prepare, serve, consume, clean up, store, and dispose of food –tasks that I collectively call "household foodwork" – are political questions disproportionately asked of those most responsible for feeding their households: mothers" (Martin, 2018, p1-2). Also in Canada, women farmers are increasing, according to Statistics Canada's 2021 Census of Agriculture: "In 2021, 30.4% of Canada's farm

operators were female, up from 28.7% in 2016″ (2021). Not only are women primarily responsible for seed saving, but they are increasingly also responsible for the whole farm. What this has to do with climate change is somewhat less obvious, however, much has been written about how small-scale peasant and family farms feed a lot of the world (Lowder et al., 2016) and simultaneously bear the brunt of climate change, since they have access to much less land and resources, and therefore any loss of crop due to climate change means a loss of livelihood.

As a female seed saver myself, I do recognize that the act of saving seeds is an act that reminds me very much of caring for children in the sense that seeds are the baby plants, and the mother plant is often already dead, so it does feel very much like adopting orphans. Putting them "to bed" in a place safe from rodents and environmental disruptions feels very nurturing and fulfilling in a similar way to caring for children. And certainly, for myself, there was a sense of providing for my own daughter in this way -- the seeds would grow food for her if she chose to cultivate them, even if I was gone or passed away. Generally in the Global North we don't need to (or want to) think about things like that in a sense, but it still feels very secure to have the knowledge that you have provided for the future even beyond the course of your own life. One Haudenosaunee interviewee -- a woman -- said "I care about the young people and I think I've been working really hard…for them because I can't take it with me. It's not a legacy I can bring with me to Sky World. They'll [the seeds] be left here for someone else…and so I feel like I've been working really hard and really dedicated to that" (anonymous informant G). Two of the Haudenosaunee seed keepers did describe the seeds in relation to their children. As mentioned above, one said she cared about the seeds as if they were

her kids. Another said she wished her children to have that skill, so that they could then make the choice of whether they continued to save their own seeds or not. If she didn't teach them how to do that, then they wouldn't have that choice available to them "why I also save seeds and garden was also to teach my own children so they are exposed to that lifestyle around the farm. And so they can pass that knowledge on when they become adults" (anonymous interviewee J). In response to a different question, the same mother also said "And then of course having kids and wanting to have our traditional food for them available, so that they can eat it and taste it and grow up on it. So that's part of it, I think too, and to know what kind of food I'm giving them, that it's healthy food…and so that probably spurs me on to make sure that I have good seed. That's gonna germinate and I don't have to worry about it and it provides good food" (Ibid). One of the male interviewees from Tyendinaga also mentioned his daughter, including his concern about her nut allergy.

> I think one of the big things that, and I don't know… if there's solid evidence of the correlation between genetically modified seed and allergies. So my daughter has, she has a nut allergy. Now, is that because it's been affected that way? Is it unfortunately just genetics between my ex-wife and I, or is it, or is it something from that seed, from those seeds that have played that role into…us eating foods and stuff like that. And then finally it has affected her (anonymous informant C).

One Settler seed saver was very proud to point out that her kids "know that carrots come from seeds…unlike my cousins in Toronto [who] just thought they came from the grocery store" (anonymous informant K).

To me the idea of teaching children to grow their own food and seed relates to climate change in that if our next generation coming up doesn't know how to work with

food, gardens, growing things, seeds, etc., if they don't have a basis in that, then they are going to be reliant on purchasing food and seeds into the future. But I think it becomes more risky to do that in the context of climate change because there are often large scale disasters that can affect large scale agriculture these days. More and more often we see entire areas of massive drought, where even industrial agriculture methods that do irrigate still lose their crops, and of course we have also seen flooding, wildfires, all of which affects our food supply. Shipping of food becomes more difficult from long distances when natural disasters get in the way, so it may very well become more crucial that we each know how to grow our own food locally for our communities so that we don't have to rely on the larger supply chains. The extent to which this is gendered is the extent to which women tend to be responsible for the gardens.

There has recently been a concern that climate change literature is more focused on the male experience than the female experience when it comes to Indigenous peoples of North America. The experiences described by male hunters out on the land tends to get more attention than the experiences of women who stay at home but are also "on the land" in their own way (Dowsley et al., 2010). In Arctic Canada, Inuit observations have been documented with a greater focus on men's observations (e.g., of sea ice, glaciers, animals and seasonal changes), as well as impacts on male-centred activities such as hunting and travelling on land and ice (e.g., Ford et al. 2006; Furgal and Seguin 2006; George et al. 2004; Laidler et al. 2009). "Men are the main hunters and navigators in most communities, spending their time largely in direct contact with the physical environment; therefore this male focus makes sense for gathering data about climate change impacts on the landscape and primary subsistence activities" (Dowsley et al.

2010, p 153). Some effort has been put into addressing this concern so that women's observations are included, from elders, younger women, and women's institutions (Ibid).

To me this is similar to the gendered experience with seeds. The ability of plants to adapt on their own just through simple observation and nurturing in a backyard garden is very different than the idea of modern-day scientific plant breeders who hybridize and, of course, genetically modify plants in order to adapt them very quickly. But as previously discussed this has not furthered food security for human beings, but rather the agenda of chemical and pharmaceutical farming. Jack Kloppenburg describes the rise of plant breeding as an economic activity in the U.S. as a male-dominated field -- which would have been the norm in the early 20th century (from Mendel to Darwin to Vavilov and so on) (Kloppenburg, 2004). Plant breeding as it plays out in labs worth millions of dollars and mainly by men gets a lot of attention and is very controversial (not to mention lucrative), whereas seed saving (a type of plant breeding) done in backyard gardens and mainly by women, rarely makes the news, let alone the academic study.

> Simply put, the seed diversity that matters to so many Indigenous and peasant farmers as well as to small- and medium-scale producers is not a priority for national and international agricultural research and development (Pimbert, M. 2021, p5).

One interesting study of community gardens in America mentions the role of women as follows: "Women's organization played a vital role in local civic improvement, and particularly urban garden promotion, at the turn of the century. Women's participation in civic improvements generally was justified as not only Christian duty but also as good civic housekeeping" (Lawson, L. 2005, p102). Perhaps this is why even in the settler population there are more women involved than men? "Disparities in wealth, gender and ethnicity, for instance, determine the way seeds are cultivated, conserved, collected and

exchanged" (Pimbert, 2021. P 1). Pimbert further elaborates on the ways in which social markers of difference shape seed interaction:

> Sustainable food and agriculture depend on the continued availability and quality of, and access to, seeds of cultivated and wild plants for renewal and adaptation to dynamic change. Different types of seed biodiversity ('cultivated', 'reared' or 'wild') are used by different people at different times and in different places, and so contribute to ecological sustainability, food security and livelihood strategies in a complex manner. Understanding how cultivation, management, collection, use and marketing of different types of domesticated and wild seeds are affected by differences in wealth, gender, race, ethnicity and age is essential for making equitable decisions on how to conserve, exchange and use seeds for human and planetary well-being (Ibid, p 2).

Hopefully this work has illuminated to some degree how gender contributes to this discussion in our two communities.

4.4 Theme 3: Adaptation

I like Collins Dictionary's definition of adaptation: "Adaptation is the act of changing something or changing your behaviour to make it suitable for a new purpose or situation" (Harper Collins, 2023). In the context of climate change, the Canadian government research paper from 2009 defined it thus: "Adaptation to climate change means taking action to respond to, or prepare for, such impacts in order to moderate harm and/or take advantage of any beneficial opportunities" (Williams, T. 2009, p2). When I began this work, I thought of adaptation only in the biological sense: plants themselves adapting through genetic changes and natural selection, with the most resilient genes being passed on simply because they were the ones to survive the new conditions and set seed. However, this research has shown me clearly that adaptation is as defined above: not just changing "something" genetically, but also changing our behaviour to "respond to, or

prepare for" climate impacts. A very interesting study done in the Arctic was called "Should we Turn the Tent?" referring to how one family had, for decades, oriented their hunting tent in the same direction, away from the wind, but in recent years the wind has shifted due to climate change. Is it only temporary, or is it appropriate now to turn the tent when setting it up?

> In 2001, a Baker Lake elder observed that the prevailing wind had shifted direction in her area. For many years she had set up her family's summer tent on the land in the same location, with the same orientation, in part so that the prevailing wind would hit the back of the tent. In more recent years, however, it has been hitting the side (Tatayakputumiraqtuq 2001). How then to decide the best orientation of the tent, when factors other than the wind also influence the decision? This incident illustrates the complex nature of environmental change faced by Inuit: physical changes in the environment, some of which are brought about or exacerbated by climate change, and the social and cultural implications (Dowsley et al. 2010. P 152).

Many of our interviewees talked about adapting their practices/behaviours to compensate, partly because they are unsure of the adaptive powers of the plants themselves. Survey participants were agreed (10/11 respondents from Tyendinaga) that climate change affects their practice of growing seeds. Some indicated that they had seen plants adapt in a positive way: "Some plants become more drought resistant". Others observed adaptation that would not be considered as positive: "I noticed that many of our plants grew very small, smaller than we have observed in other years, before flowering and producing fruit…Very stunted-possibly due to lack of water, and presence of extreme temperature changes for the beginning of the growing season (it was very cold in the spring, then the temps went very hot). I also had a few corn plants (Luther Hill variety) express themselves as more of a grass than developing edible cobs." Of the settler survey respondents, closer to half said that climate change affected their practice of growing

seeds (11/19 said it did, and 8/19 said it did not). Asked if they had seen crops adapt, only the two respondents previously mentioned who identified their tomatoes as adaptive said yes. Most said they had not been saving seeds or growing food in Kingston long enough to observe plant adaptations. However, many did list ways in which they have adapted their growing techniques, such as "added more rain barrels, using more mulches", "…I used to till my soil every year and now I just leave it-it is covered with straw in winter and cardboard." Most mentioned collecting rainwater and mulching soil to combat drought and high temperatures. When folks from Tyendinaga responded to the same question (have you adapted your growing practices, and if so, how?), there was one response about watering more, but more responses were about observing and learning. One respondent elaborated: "More emphasis on companion planting (3 sisters), more time taken to understand our land's nature and characteristics at the planning stage…" Another stated: "I make sure to start plants according to weather predictions, or purchase seed that is more adapted to the changes in climate…I have also taken more time to learn about how seeds adapt to climate so that I can begin putting those practices in place."

All this is reflective of the growing body of literature surrounding the role of humans (active) vs the role of "nature" (passive). Settlers believe that they must be active in adapting their practices to changes in climate, in order to save the plants -- which would certainly die without intervention. Indigenous seed savers, on the other hand, are watching and learning from the plants themselves and the environment generally, recognizing perhaps that they are not the only "actors" with agency. Paul Robbins points out: "Of course, nature is more than just passive, manipulated, resources…people are constantly making incidental natures, interacting with nonhuman species to create

environmental outcomes of startling complexity" (Robbins, 2007. p12). In writing about the political ecology of the American lawn, Robbins argues that the lawn itself has created "Lawn People": people who, despite various beliefs about the environment, have co-adapted as communities to treat their lawns in a particular way. As in the first example of the tent, there are implications beyond just the environmental ones - they are social and political as well.

In terms of food:

> In crops, breeding is an appropriate adaptation response where it complements **management changes**, or when the required management changes are too expensive or impractical. Breeding requires the assessment of genetic diversity for adaptation, and the selection and recombining of genetic resources into new varieties for production systems for projected future climate and atmospheric conditions. As in the past, an essential priority entering into a 'climate-changed' era will be breeding for resistance or tolerance to the effects of existing and new pests and diseases (Emphasis added, Chapman et al. 2012, p 251).

Biologically speaking, "We still have a limited understanding of how adaptive evolution, phenotypic plasticity, and gene flow will interact to influence population persistence under climate change" (Anderson & Song, 2020. P534). Further,

> One outstanding question is whether populations are able to adapt to ongoing climate change from standing genetic variation (Sheth et al., 2018; Bemmels et al., 2019), introgression via gene flow (Bontrager & Angert, 2019), or novel mutations. Indeed, we must achieve a greater understanding of how these sources of adaptive genetic variation will contribute to climate change responses in a diversity of species that vary in geographic distribution and life history strategies (Ibid. p534).

Clearly, investigating population adaptability will include some level of scientific analysis, whereas investigating farmer/practice adaptations may well be a sociological question. This indicates the urgent need for transdisciplinary studies, since both types of adaptation are necessary moving forward. Perhaps some adaptation of academia is also called for in the face of climate change! The same article concluded:

> Thus, at the ecological level, climate change will re-shape communities. Interdisciplinary research will more effectively address critical questions about the biodiversity consequences of climate change, from genetic diversity within and among populations of one species to species diversity within and across communities (Ibid. p 539).

In this case they are discussing plant communities, and the "interdisciplinary" study they call for still includes only the sciences ("An interdisciplinary approach that leverages ecological, evolutionary, and genomic tools" Ibid).

My interviewees in both (human) communities stressed the importance of allowing plants to change while changing their own gardening practices as well. One clear difference was that settler seed savers are much more willing to shop around for varieties that may suit new conditions better than varieties they previously saved. This is a method that is often touted in the scientific literature: variety trials are widely used to determine IF a variety will grow successfully in your conditions or alternatively WHICH variety of many candidates will do so. Indigenous growers, on the other hand, were determined to grow the same varieties their ancestors have grown --their particular seed relations -- and were willing to let the plants tell them what was needed to help them adapt. The sense is that the plants will tell the humans how to adapt their growing strategies in such a way as to support adaptation of the plant itself -- very much working together in a committed relationship, with mutual benefit as the goal. Both groups seem to have the intention quoted above from the Government paper: "to moderate harm and/or take advantage of any beneficial opportunities" (Williams, 2009, p2). However, the way of going about it is quite different.

Chapter 5 Winter Again: More Dreaming

As a beginning to a future of saving seed in a good way, and as a means to increase and support seed saving for food security, we can consider the following guidance that emerged from this research.

A community guide to Seed Sovereignty and Security in the context of Climate Change

1. Recognition: No Food Security without Seed Security

Communities wishing to increase food security for their members need to assess the current capacity for seed saving of food crops, along with capacity for hunting/fishing/foraging. The majority of food grows from seeds, therefore no food crop seeds = little food.

2. Affirmation: We Can Grow Seeds

Right now a (relatively) small number of seed varieties are protected by legal mechanisms such as Plant Breeders Rights (PBR) and actual patents such as are found on Genetically Modified/Engineered seeds (GMO/GE). While these cannot legally be grown for sharing in any way, they are the minority of varieties, and are mostly not accessible to the home gardener. Most vegetable and herb varieties are not currently registered in any system and can legally be grown, saved and shared freely within the boundaries of this country. Knowledge of how to do this is also available at this time, but is becoming more rare and less accessible as Elders pass away. We can grow and share the seeds that will feed us in our communities, but we must take action now to do so, before the seeds and the knowledge are completely eroded.

3. Recognition: Seeds are Vital Cultural Heritage

Whatever culture/s we come from, there are also seeds related to that culture. All over the world our ancestors engaged in agriculture to greater or lesser degrees. They ate seeds and grew crops from seeds. We may or may not live in a similar climate to what they experienced, but we still rely on seeds for food and therefore survival. Wherever we live now we can acknowledge the ancestors of that land and research the seeds they relied upon. Wherever we come from we can acknowledge our own ancestors and research the seeds they relied upon. Before we save seeds, we must make this recognition, in order to avoid stealing the cultural heritage of others, and in order to be firmly rooted in our culture. The Two-Row wampum of the Haudenosaunee/Dutch shows an appropriate and good way of saving seeds for the future.

4. Education: Raising Awareness is Key

Much as communities must educate members as to proper disposal of waste, water safety, road safety, services available and more, seed and food security are a matter of raising awareness. This research has shown that the general public doesn't think of seeds as something they can grow themselves, and this is not conducive to future food security for communities. Many communities now offer marketing strategies that promote "Local" businesses in various ways, and many support local farmers markets, meal programs, food banks and school breakfasts/lunches to increase the well-being of members by increasing access to food. These tend to be short-term solutions that would not hold up in the context of climate change/times of crisis, but they form a precedent for raising awareness in communities around issues of food access and security.

5. Risk Management: Emergency Services and Insurance

All communities have systems in place to help members in times of crisis. Climate change is a "long crisis", with its effects continually eroding peoples' well-being and mental health. The insurance industry is preparing for the effects of climate chaos by requiring certain preparations and through their education and marketing. As always, wealthier members of communities will likely have access to what they need because they can pay for it, but less wealthy members of communities often make up a significant number of constituents and members and these will tend to be less insured and more reliant on public services. An example of pro-active municipal work is found in the city of Belo Horizonte in Brazil, where food insecurity was declared to be a market failure which required government intervention to correct (IPESFood 2017). Encouraging communities and community members to grow and save seeds, maintain public seed repositories and gardens will ensure locally-adapted seeds are available at the appropriate time in a crisis.

6. Engagement and Evaluation: community-led

Partnerships between/with existing stakeholders (Indigenous and non-Indigenous) such as farmers, teachers, municipal staff and business owners (for-and non-profit), using community surveys and focus groups will help make this meaningful and encourage participation. Hopefully this aspect will address the differences between communities, so that Indigenous communities are engaged on the level of nurturing family relations (as seeds) and rematriation, whereas Settler communities are engaged on the more comfortable level of collecting and growing important "heirloom" seeds that can be part of "the commons", and that contribute to food security. Engagement should always

include celebrations, meal-sharing and other appropriate social time. Respect, cooperation, honesty and transparency are key.

7. Know and Respect the Land and Treaties

All of us who live in Canada have a responsibility to honour the treaties and wampum commitments locally. It will be an enriching experience to learn about how these are related to our foods and waters and to our very survival. Ethics around saving seeds of traditional and Indigenous crops can be developed using the treaties and other pre-existing templates so that for the future we can be food secure in a good way (without harming others).

5.1 Conclusion

Corporate agribusiness firms are likely to "lobby governments directly to establish trade and investment rules that work in their favor. And…actively engage in shaping public debate over issues around which their business is concerned" (Clapp, J. 2020, p102). Unlike them, seed savers are very humble and don't spend much money or make claims about their abilities to feed the world in a time of climate chaos. Nevertheless, they work away, tirelessly adapting their growing techniques and observing changes in their gardens, such that the seeds keep producing food and more seeds in the face of climatic changes. They are aware of the benefits of their practice, but don't brag about it, or try to push it on others, although most are happy to share their expertise and, importantly, their seeds, when requested. One popular venue for this free exchange is at the local Seedy Saturday or Seedy Sunday event, but it also happens through the Indigenous Seed Keepers Network and other local networks. Seed savers observe that there are obstacles

for others to save seeds, and they know what the obstacles are that they had to overcome, and what they continue to overcome. But they continue to see benefits, and so they persevere in their seed saving practice. This research has highlighted how seed saving has similarities and differences for both Indigenous and Settler communities, and how important it is to be in relationship with our food crops in order to work with them to continue to grow nutritious foods in the face of climate change. Changes are already being observed in gardens, and both the plants and the gardeners are actively adapting in order to continue to feed us.

Seed savers will continue to be challenged to make this relationship a healthy one that leaves no one behind. Seed saving can be a re-colonizing act or a de-colonizing act, according to how we choose to proceed. It seems to me from this research that we have some choices to make in terms of our future. In the past (as already mentioned in this paper), newcomers to this continent were literally saved from starvation by Indigenous people, who shared with them varieties of food crops that were nourishing and grew well here. Many of those same crops were later taken all over the world, given English/European names and then brought back to Turtle Island. In future, I hope we will acknowledge the truth of this injustice and strive not to repeat it. Settlers can choose to honour the plant varieties as co-evolutionary partners and as "the Sustainers", as modelled by the Haudenosaunee. As signatory to the UNDRIP, Canada as a nation should be moving towards acknowledging seeds as important biocultural heritage.

This thesis leaves many stones unturned, and much more work is needed to explore the notion of ethics in seed saving, the specifics of saving seeds in a good way, and also the various ways seed savers, both settler and Indigenous, can be better valued

and supported in overcoming the obstacles identified here. It is even possible now to explore whether seed saving could be part of the key that breaks us out of the current economic system we seem to be trapped in, but that is also for another paper. Wherever we came from, seed saving as an agricultural practice, is our heritage. It still feels to me to be a very important part of our future as well. For as long as we eat food not grown in a petrie dish, seeds will continue to be a key element of food production. Seeds grow food, but they are also so much more than food. They are potential, givers of life, partners and family across the past, present and future. They represent healing, security, nourishment and co-creation. As Traditional Ecological Knowledge, seed saving/keeping research will be valuable to science and to the humanities. May this paper be a small seed that grows and flourishes to benefit future generations.

Chapter 6 Appendices

Appendix 1

Seed Security and Climate Change research /what makes people take action to save seeds
Part I, The Seeds

Question 1: Do you grow your own seeds?
Question 2: Do you believe your crops are adapting to the changing climate, and if so, how/please give examples. Do you believe your crops are changing from when you started saving them until now? Please give examples. Do you believe your crops are changing as you grow them?
Question 3a: Do you share your seeds and food in the community? If so, how :is it income, are they gifts, do you share with your neighbour or family?
B: Do you see your seeds as community seeds, and How do you define community seeds?
Question 4: What is the oldest seed/food crop for which you have seeds? How long have you been growing that crop here in the community? Storytelling opportunity
Part II, The Practice

Question 5: How long/how many years have you been growing and keeping seeds?

Question 6: What was the catalyst that finally got you to grow for seed? Describe how you thought about growing seeds in the past, and then what caused you to actually start growing and keeping seeds?

Question 7: What seeds did you first save? What seed crop do you now see as most important and why? Are they community seeds?

Question 8: Which have been the most challenging seeds to grow and save, and which the most successful?

Part III, Obstacles

Question 9: What were the obstacles that kept you from keeping seeds before you started?

Question 10: What obstacles do you see for others in your community who don't currently grow seeds, and particularly young people?

Appendix 2

Sowing seeds of the past

God of all creation, may we be aware of your presence, even in the smallest seed — Heirloom Seed Sanctuary Prayer

Historical Beginnings

When the Sisters of Providence of St. Vincent de Paul moved to 1200 Princess Street in Kingston in 1930, they tended gardens which provided vegetables for those who resided on the property. By the 1950's, they continued to maintain the gardens but no longer depended on them as their main source of vegetables. In 1994 the Sisters recognized their responsibility to the integrity of creation and thus an Environment/Ecology Committee was established. Through this committee, organic gardening began once again on the Motherhouse grounds. Later, a greenhouse was built using recycled windows; the century old barn was renovated and is now used for seed storage and workshops. It is called the Heirloom Seed Sanctuary. In 1999, Robert and Carol Mouck, organic farmers, who had supplied us with seeds offered to manage our greenhouse and expand the gardens. The location became a safe place for seeds the Moucks had grown and saved over the twenty years they farmed organically at Foxfire Farm near Napanee. The seeds in the collection are open pollinated; they can be planted and saved each year as part of sustainability. Such an experience opens one to a reverence for the creative spirit in the seasonal cycles that are intrinsic to gardening. As the Heirloom Seed Sanctuary became better known, the Sisters wanted to continue their commitment to the environment. In 2008, gardener and seed saver Cate Henderson was hired to continue this unique ecological project.

Educational Activities

Heirloom Seeds are links between the past and the future

•Workshops on seed saving are held in the HSS barn every month.

•Providence Spirituality Centre, situated on the property, offers ecological retreats and workshops.

•Workshops, weed walks, garden tours and celebrations of seasonal changes (Equinoxes, Solstices) are important annual events at the barn and grounds.

•Heirloom Tomato Day: The annual Heirloom Tomato Tasting Day has retained its popularity over the years. Visitors are surprised to see the vibrant colours and taste the richness of the varieties, some over 200 years old. A special tomato seed saving workshop is hosted in the barn this day and the gardens are open to the public.

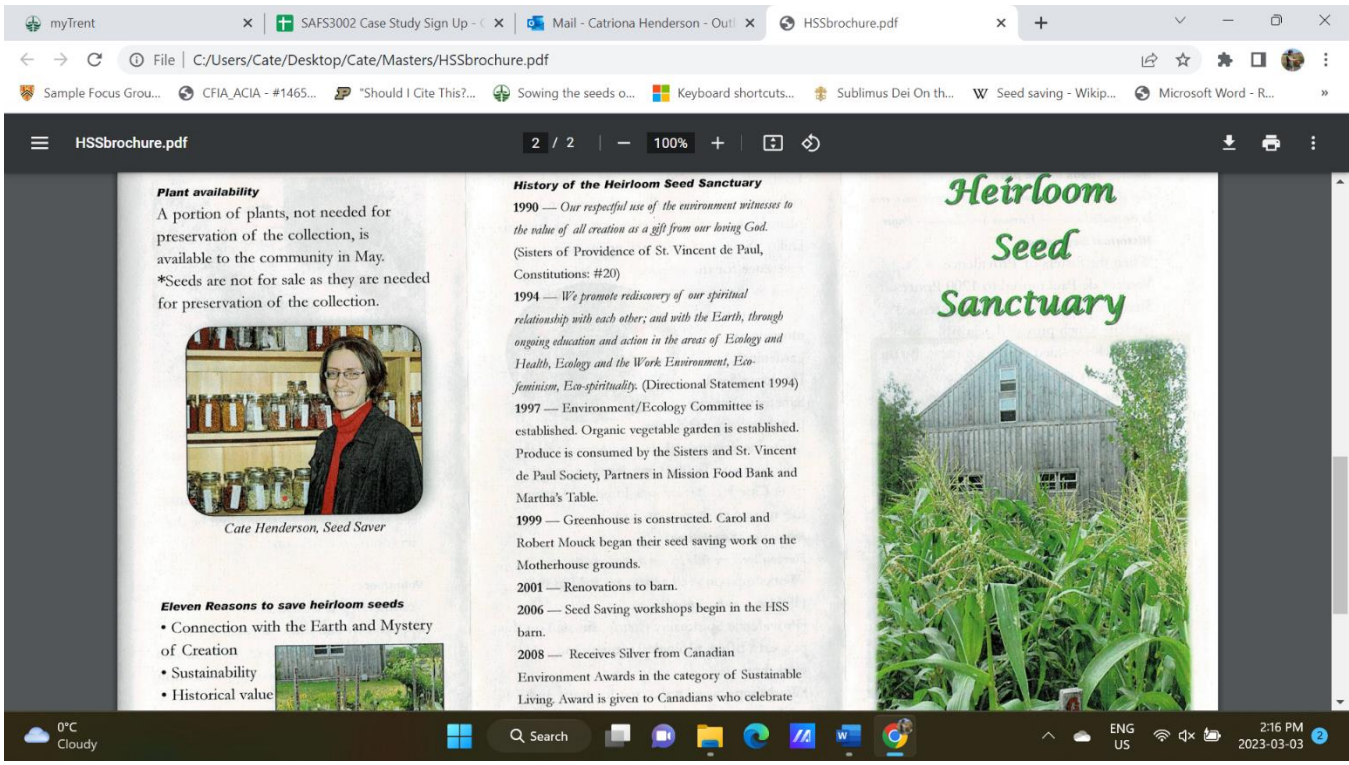
•Seedy Saturday is an annual community seed sharing event co-sponsored by the Heirloom Seed Sanctuary.

Volunteers

Volunteering is an educational opportunity and those interested can contact Cate Henderson in the Heirloom Seed Sanctuary. (See contact information)

Varieties

There are approximately 100 varieties of tomatoes, 35 varieties of potatoes and 70 varieties of beans, some dating back to the 1500s. Also in the collection: cucumbers, lettuce, peas, swiss chard, eggplant, garlic, carrots, beets, spinach, celery, parsnip, watermelons, melons, squash, pumpkin, corn, radish, turnips, peppers, flowers and herbs.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Plant availability
A portion of plants, not needed for preservation of the collection, is available to the community in May.
*Seeds are not for sale as they are needed for preservation of the collection.
Cate Henderson, Seed Saver
Eleven Reasons to save heirloom seeds
• Connection with the Earth and Mystery of Creation
• Sustainability
• Historical value
History of the Heirloom Seed Sanctuary
1990 — Our respectful use of the environment witnesses to the value of all creation as a gift from our loving God. (Sisters of Providence of St. Vincent de Paul, Constitutions: #20)
1994 — We promote rediscovery of our spiritual relationship with each other; and with the Earth, through ongoing education and action in the areas of Ecology and Health, Ecology and the Work Environment, Eco-feminism, Eco-spirituality. (Directional Statement 1994)
1997 — Environment/Ecology Committee is established. Organic vegetable garden is established. Produce is consumed by the Sisters and St. Vincent de Paul Society, Partners in Mission Food Bank and Martha's Table.
1999 — Greenhouse is constructed. Carol and Robert Mouck began their seed saving work on the Motherhouse grounds.
2001 — Renovations to barn.
2006 — Seed Saving workshops begin in the HSS barn.
2008 — Receives Silver from Canadian Environment Awards in the category of Sustainable Living. Award is given to Canadians who celebrate
Heirloom Seed Sanctuary
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Appendix 3

To i:i tetewatharonnyon! Let's talk!

We are looking to host community discussions around gardening
and seed keeping practices to share strategies, knowledge, thoughts, and ideas.
If you are someone who has long been gardening, seed keeping and sharing seeds in our community,
we would love for you to join us in one of these discussions.
OR
If you are new to gardening or are interested in becoming involved,
we would also love you to join us in one of these discussions. Research is being undertaken to determine if seed saving and Seed Keeping Networks
help to make community more food secure in a time of changing climate and pandemic,
and we would love to hear from you!
What brought you to start keeping seeds?
What obstacles have you faced growing and keeping seeds?
Let's talk!

Contact Cate Henderson, MA Sustainability Studies candidate:
catrionahenderson@trentu.ca

Appendix 4

Elements of the Research Question	Method 1: Survey	Method 2: Interviews	Method 3: Literature Review	Method 4: Autoethnography
How does seed security relate to food security?	Multiple choice, Rank answer in order of importance.	Explore further	Scan of food security documents, note references to seeds	Seeds grow food
How does climate change affect seed growing in practice?	Does climate change affect your practice of growing seeds? Y/N	List examples	NA	Compare growing practices and techniques I have used
What could be considered "Community Seeds"?	Do you consider the seeds you grow to be community seeds? Y/N Why/Why not?	Explore further	Does this term come up in the literature, or is there a comparable term?	From my own experience, community seeds as opposed to corporate seeds
How do seeds adapt?	Have you seen crops adapt Y/N if so, how?	Do you have a story to tell of a crop you saw adapt?	How is adaptation defined in the literature in relation to climate change?	Compare stories, add my own

Results	Survey	Interviews
Indigenous -- Tyendinaga	11	8
Settler -- Kingston	19	12

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