How to Grow a Peach

by

Alma Elainne Gaeta

A Thesis
Submitted in partial fulfillment
of the requirements for the degree
Master of Environmental Studies
The Evergreen State College
December 2021

This Thesis for the Master of Environmental Studies Degree

by

Alma Elainne Gaeta

has been approved for

The Evergreen State College

by

_____

Kathleen Saul, Ph. D.

Member of the Faculty

_____

Date

Abstract

How to Grow a Peach

Alma E. Gaeta

I welcome you to take a walk through my peach orchard in four seasons. Each season, I weave together ways of knowing to enrich the understanding of what it means to grow a peach. I braid together three central approaches which include: positionality, philosophy, and practice. The threads of positionality reach back into ancestral knowledge and investigate the racialized history of agriculture, as well as the more recent shifting narratives conceived by women, reminding us of issues of justice in that landscape. Philosophical threads bring in questions of the responsibility of the researcher (axiology) and the synergy of different ways of knowing (epistemologies) based on Indigenous knowledge. I weave Practicality in through orcharding experience and a quantitative and qualitative study of orchard floor management. The quantitative aspect involved a compost mulch application experiment in my organic peach orchard comparing nutrient levels. Results indicated that there are significant differences in sodium and potassium levels between treatments, but other nutrient measures remained stable and within recommended limits. The qualitative component consisted of interviews conducted with orchardists as a form of cooperative inquiry. Thematic analysis of interviews centered on networks and knowledge diffusion that reinforced the importance of informal knowledge and social networks and discusses the effects of harassment. The interconnections formed by braiding all the above ways of knowing are situated within visual imagery, making use of the metaphorical mind within shifting seasons in the orchard. As you walk next to me and my long braid through the seasons, I share a story that describes how I eat peaches ‘til I become a peach.

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Acknowledgements

I want to thank Kathleen for her unwavering support and patience throughout this process. Her mentorship and deep listening gave me the space to explore different ways of knowing connected to culture and experience.

Thank you to my partner David Benziger for always believing in me.
A mi familia: Ustedes son mi raiz y motivacion, en especial a mi mama que
me saco del huerto tantito para terminar mi maestria y a mis 3 hermanit@s que
me motivan a luchar por un mejor mundo.

A mi abuelito Rogaciano Gaeta Gaeta con su magia en el huerto. I want to also thank my community of danzantes for welcoming me into a safe space where we can practice and recover Indigenous tradiciones that have shaped my subconscious. In particular thanks to la familia Mora, Dona Mari, Don Lucio, familia Gadea-Escandon, Roberto, y a Calpulli Ollin Yollitztli.

To my colleagues, teachers who have generously challenged me. John Withey, Esmael Lopez, Will Golding, Lisa Muñoz, EJ Zita thank you for keeping me accountable by sharing your perspectives, time, and deep knowledge. Deep gratitude for Ora Marek-Martinez whose work on Indigenizing the Academy had a deep impact in this work and my life. Thank you to my orchard community for their participation.

I thank the sweet scent of peaches in the summer air, the corn leaves rustling in the wind, and the magic moment when a seed bursts into life—going from dormant to full of possibilities. Tlazocamati Tonantzin Tlalli.

Chapter 1: Introduction

Author's Note

I want to acknowledge the Wasco, Wishram, and Chinook communities are the traditional and current stewards of the land in the region where I farm, presently known as Hood River, Oregon. Throughout my work, I make use of the terms "Indigenous" and "Native" with great intention to reflect the deep connections that have existed between people and places for thousands of years. "Indigenous is inclusive of all first peoples—unique in our own cultures but—common in our experiences of colonialism and our understanding of the world" (Wilson, 2008). It is essential to recognize the complexity in this term, especially in regard to people, cultures, and traditions which have been displaced and targeted for assimilation or eradication.

I center my particular positionality in this work in connection to Indigenous scholarship. Reconnecting to my Indigenous roots as a Xicana woman has been an enriching but also sometimes painful path and one that will surely continue throughout my lifetime. Xicana is a term derived from the Chicana movement, which describes the unique Mexican-American experience. Adding the "X" in the beginning signals an understanding of Mexican identity through Indigenous roots. This narrative presents a snapshot of that journey and is modeled from other Indigenous scholars as guides for my work. It is my intention to build a relationship with my community through the methodology described in later sections but also with the readers of this work. I welcome you to a walk with me through my orchard while reading this work and welcome your feedback as a discursive process of knowledge sharing.

Introduction

"Research is all about unanswered questions, but also reveals our unquestioned answers" (Wilson, 2008, p.6).

I walk up and down rows of peach trees in the orchard every week, observing the seasonal changes every year that passes. During warm summers, I'm wearing traditional huaraches like the ones my abuelito wears– the kind with soles made of tire pieces and woven together with leather strap tops. When I see those huaraches, I feel that he's there with me walking down the beautiful rows of trees, looking at the mountains and tall pines off on the horizon. He's never traveled here, but I feel him with me in these moments. Not only is he here walking new lands with me—so are my ancestors, coming to lands previously unknown to them. Oregon is a huge contrast to the home of my ancestors in the high desert areas full of delicious cactus and spiky shrubs in Zacatecas, Mexico. Still, I build my relationship to this land with deep gratitude and humility.

Each season contains specific imagery that dictates my work in the orchard, and in turn, has also influenced the structure of this thesis which incorporates metaphors and knowledge imparted by each seasonal cycle. Summer's sweet peaches, Fall comes with swirling leaves, Winter with snow, and Spring with peach blossoms attracting bees from all around.

As an orchardist, as a woman, as a Xicana I discovered aspects of myself that were embedded in my research questions as they developed. I thought about community and relationships. I also uncovered ways in which parts of my identity have been historically excluded and how often under the guise of "objectivity", they have been

devalued and repressed. By using “practice” as a means to launch into storytelling or “narrative approach”, I was able to weave in decolonial practices and develop a more broadly accessible record of my work. Finally, through philosophy, I made space to zoom in as closely or broadly into the topic as necessary to weave in my Western education with Indigenous traditions, both of which have shaped my thinking and work.

In any given season, I’m usually wearing my long hair in a braid to keep it from catching in the branches—but also because braids carry deep meaning connecting me to my ancestors and Indigenous ways. Braids provide excellent imagery as they weave together three strands into a single entity that is much stronger than the sum of its components. The images of the four seasons and long braids help me divide and connect the understandings cultivated throughout my thesis endeavors. They provide a structure from which to share an authentic story of growing peaches, community, organic practices, and Indigenous knowledge.

Structure

My writing incorporates three perspectives, woven together like braids throughout my work: positionality, practice, and philosophy. As a Xicana, I practice code-switching to communicate effectively with different members of my family and community. One moment I’m speaking Spanglish with my brother, then my mother walks in to bring us food and we switch to Spanish without flinching. We all practice a type of code-switching depending on whether talking to a sibling, mother, or fellow academic. This work builds on a similar process by writing from the following three codes or strands that I braid together:

Positionality

Practice

Philosophy

These perspectives, or codes, are introduced separately but woven together throughout the following sections. Positionality introduces my identity and describes how cultural experiences shape ethics and worldview, within and without the dominant narrative of Western European thinking that shapes the bulk of academic research. Practice describes natural cycles in the orchard and provides imagery that grounds the chapters in practicality and metaphor. Philosophy encompasses theoretical approaches, discussion of paradigms, and methodology. All strands are woven together to convey the complexity of a seemingly simple act of growing a peach through the four seasons.

We'll walk into the orchard in the midst of summer where the heavy scent of peaches hangs in the warm air, luring us for a closer look. We'll lay down under the canopy to consider methodological structures and practical considerations of "How to grow a peach" and we'll even consider the idea of how to become a peach. As the Summer cools into Fall, I will share conversations with other orchardists and their insights into how they acquire information to manage an organic orchard. By then the leaves are falling and we are getting ready for the upcoming dormant season. Winter is a time for rest; I will discuss how this time is not only pivotal for peach blossom development but also how rest can be considered a revolutionary act. By the time Spring comes around, new hopes and aspirations for a better season start to take shape. Here I share a mulch experiment I conducted in the orchard. This will connect us to soil health and the broader impacts of soil management, reflecting on our responsibility as stewards of the land.

I introduce each of the sections corresponding to positionality, practice, and philosophy separately in this chapter. All following chapters have combinations of these three strands, but they are not separately labeled. Instead, the three strands are braided together weaving back and forth between the three throughout the seasons.

Positionality

"Recognizing that we ourselves are reflections of the values and norms of the larger society allows us to step back and reassess those values" (Merchant, 2005, p.6).

Every summer as a child, I looked forward to watching my abuelito Rogaciano Gaeta farm in Tlaltenango Zacatecas, Mexico. From a young age, I would trail after him in the cornfields, entranced as I watched him stoop low and reverentially pull radishes out of the soil. At that age (and even now), it was sheer magic how he manifested food out of thin air. I noticed the uniqueness in how he moved through life. Not just in the muscular build of his body but in the little glimmer in his eye and in the community he built around him. When I visit him now, he points out all the plants while walking me through his huerto sharing stories and carefully stooping to collect flowers until I have a full bouquet in my hand by the end.

Near the end of summer 2020, I called my abuelito to grieve that my corn seed had been eaten by a mouse and seek his advice. In the midst of telling him this story, he asked me to wait on the line so he could tend to a customer. He kept the phone with him, and I heard him trying to make a gift of his corn to a customer so she could make atole to sell at the local open-air market. The simple act of hearing him engage in a

gift economy reminded me about the importance of building relationships between people and resources. This moment was a reminder of the unique philosophy and values encoded within my family and culture that shape my consciousness. The mouse eating my corn didn't seem so devastating after all. I heard him laugh and realized this was an opportunity to reconnect with my roots and understand my foundational values. It was a deep realization that as researchers, farmers, and people we are deeply impacted by our unique life experiences. Being aware of those experiences helps us contend with bias and use our experience as leverage in the work we do.

My abuelito reminds me of the deep service and relationships we hold to nature and community. His body also reflects the heavy stoop labor that he experienced during the Bracero program. The narrative presented throughout this work shares a story of how I carry on after my abuelito, manifesting peaches out of thin air, building relationships, and restructuring my family's relationship with agriculture and nature. It is my intention to convey cultural perspectives that shape my work while bridging them to formal academic training I have received without necessarily separating them. My family's history requires me to include a section on the racialized history of agriculture and how that continues to impact Mexican and BIPOC communities today. We'll take a walk in the peach orchard, reflecting on seasonal cycles and what they can teach us.

I recognize that cultural assumptions embody how people relate to place and knowledge. Rather than trying to conform to a narrative centered around white-male-dominated research, I choose a story-telling approach that openly conveys how I relate to my research and community. I challenge conceptions of linear rationality and objectivity

by weaving sources of knowledge in a narrative approach that incorporates circular thinking.

Practice

Peaches are born out of a deep and ancient relationship between humans and plants that began long ago in western China, as far back as 3000 BC (Layne & Bassi, 2008). Genetic studies trace the geographic origin of peaches to the Tarim Basin north of the Kun Lee Mountains. One of the many names for peach is the Latin denomination *Prunus persica*, which harkens to a time before the 19th century where its origin was assumed to be in Persia. While peaches made their way west via Persia, they did not make it to the Americas until around the first half of the 16th century. Peaches were grown by Indigenous people in the Americas and propagated by seed.

While the concept of propagating peaches by seed can seem simple, it warrants extra attention here. Most fruit trees and shrubs are propagated by cuttings to preserve varieties; essentially creating clones. It's common practice to produce a whole orchard of peach trees without planting a single seed by propagating cuttings over and over again. In contrast, when a peach seed is planted, a whole new variety is created because it recombines the genetic material of the parents.

For example, I grow a very common variety of peach in my orchard called Elberta. This is considered an old variety and a staple in the canning industry. People call me every season asking when the Elbertas will be ready and share stories of when they canned Elbertas with their mothers to be able to eat them all winter. The only way Elberta stays true to type is if it is cloned, meaning it is propagated by cuttings. So, all my Elberta

peaches are clones of each other and clones of the original Elberta tree. The alternative approach to cloning was planting by seed. Indigenous people who planted peach seeds generated new combinations and varieties. Today, we have their approach to thank for the many varieties of peaches we grow and cherish. This highlights how even a difference in propagating philosophy can lead to drastically different impacts.

This narrative is divided into four seasons that are commonly identified in North America; astronomical forces that cannot be halted. However, even this bears some attention. At first glance, dividing a year into four seasons can seem objective enough, yet it is merely a localized convention. Not all regions on the globe identify with the four seasons depending on their geographic position relative to the equator or other cultural factors. The Gregorian calendar uses the conventional structure: Spring, Summer, Fall, and Winter. Often, it is divided based on equinoxes and solstices, but some prefer to make the division on meteorological groupings based on weather patterns. Some ecologists use a convention of six seasons: prevernal, vernal, estival, serotinal, autumnal, and hibernal. There are cultures that identify two, three, or even six seasons depending on their location in the globe and cultural experiences. This dialogue intends to point out that even if we can logically explain our conventions, many other conventions exist outside of that. I aim to challenge some of the unquestioned conventions used in academia by employing a narrative approach in my analysis. So you see, growing a peach isn't quite as simple as it seems at first glance and provides a rich landscape of metaphors.

Philosophy

I incorporate various approaches to get to the heart of my initial research question:

"How do organic orchardists develop the knowledge to manage their orchards?"

What started out as a simple experiment around the soil nutrient effects of mulch treatments, soon generated additional questions on how I could share my findings with others. This sense of responsibility as a researcher led me to reach out to my local organic community. I could have chosen the route of publishing my mulch study, but I couldn't help wondering, "Will other orchardists be able to access and apply this knowledge?" Not only did this lead to considering theories of knowledge diffusion and social networks but to theories on knowledge itself and Native science concepts of relationality. These epistemological questions carried ethical implications about my responsibilities as a researcher. Not only around how knowledge is developed, but also for what purpose. This inherently led to questioning dominant structures of knowledge for knowledge's sake. Dominant research paradigms portray knowledge as being generated or owned by individuals. This is in stark contrast to the Indigenous paradigm where relationships are an essential feature of knowledge (Wilson, 2008). Throughout this work, I explore Indigenous research methods to broaden my perspective represented in this work while exploring my own positionality.

Indigenous Research Methods and Native Science

"Unfortunately Indigenous researchers have often had to explain how their perspective is different from that of dominant system scholars; dominant scholars have seemingly needed no justification in order to conduct their research" (Wilson, 2008, p.55).

Rather than spending time justifying Indigenous methodologies, I'll give overviews and descriptions throughout the following sections. I apply a demonstrative approach through the use of story-telling, non-linear analysis, and centering relationality. I convey my work in a narrative approach to account for relationships within nature and community that are part of this research. I allow my story to follow a non-linear structure by visiting topics without having to pursue each one to exhaustion as they're introduced. Rather, topics appear and connect to other topics and I follow their interconnections until I circle back to the same topic again. Storytelling is a method. Relational accountability is examined and guides this work.

Four Seasons

I choose the convention of four seasons as a common practice in Western education systems but also because of how they are connected to Indigenous traditions in Turtle Island (North America). The latter forms connections between human anatomy (four limbs), the four cardinal directions, and the solstice and equinox points. As a guide, I travel through the four seasons in the orchard to connect us with practical aspects of this work.

Summer - Harvest

Fall - Compost

Winter - Dormancy

Spring - Flowers

I start with Summer to discuss the delicious but bittersweet images of harvest to set the stage of the context within which I exist as a Xicana and orchardist in my community. This is followed by an analysis of interviews through a process of cooperative inquiry that connects to metaphors of composting. The Winter chapter presents a response to the racialized history of agriculture through stories of women who are working to shift those narratives, making space for BIPOC communities to develop healthy relationships with agriculture and nature. The final season presents a mulch study that compares three mulch applications to the orchard and an analysis interpreting those results and implications.

Thesis Anchoring Questions

I began this thesis with a question:

How do I organically manage an orchard floor?

This question led down many paths, which centered around my responsibility as a researcher, as an orchardist, and as a Xicana. I endeavored to explore how I could share this information with others, which led me to investigate how organic orchardists acquire information that shapes their management systems. The result of this only generated more questions, which resulted in a narrative presentation.

I include in the following chapters an organic mulch study in my orchard with statistical analysis, a series of interviews with qualitative analysis, and practical descriptions of how to grow a peach. These are situated within historical contexts and visual imagery that provide a holistic perspective on how I approached these initial

questions. The crux of this work revolves around a natural science experiment and a social science project around these questions:

- **Do different organic mulch types affect soil quality in my organic peach orchard in Hood River?**
- **How do organic orchardists in Hood River acquire knowledge to develop their organic management plans?**

The mulch studies and interviews are discussed in detail in Spring and Fall respectively and take place both within my orchard and community in Hood River, Oregon. Summer and Winter provide opportunities to develop metaphors that help explain some of the methodology and meaning behind this narrative. It is my intention to create a dialogue with my community and the reader here in order to be open to opportunities for collaboration and continued learning. I can then articulate the details that led this story and some of the values associated with it, rather than leaving them to the background or leaving them out entirely, as is often done in formal research. Let's take a walk through the orchard starting with Summer harvest and moving through the natural progressions of the seasons.

Chapter 2: Summer- Eat Peaches ‘til you Become a Peach

Introducing the Storyteller

My name is Alma Elainne Gaeta Rivas and all components of my name trace to relationships built between families and generations. My family is deeply rooted in the state of Zacatecas, Mexico- a region that is the traditional lands of Zacateco and Caxcan people. Systematic violence and oppression have been carried out to erase these Indigenous cultures to the point that the Caxcan language has ceased to exist, and Caxcan people have been considered virtually “extinct” (Pouwels, 2006). As Mexicanx, our complex identities contain unique combinations of Indigenous and colonial lineages. However, the collective Mexican identity and culture are deeply rooted in Indigenous traditions evident in the language, food, symbology, and values. Mexico was built upon thousands of years of Indigenous knowledge and traditions that developed in each unique region.

As a Xicana, I feel a responsibility to uphold aspects within my culture and lineage that have been systematically oppressed. I build my understanding and community in recovering indigenous knowledge within our lineages as a danzante Chichimeca through dance and ceremony. My community of danzantes connects Indigenous people from what is now known as Mexico to share and piece together inter-generational traditions. It is a space to exchange and put into

practice Indigenous knowledge. In addition, I have had important mentors and opportunities to engage with Indigenous academics to whom I offer my gratitude in reconnecting to these roots.

My writing is deeply rooted in exploring positionality, a term used by feminist social scientists to describe how our lived experiences are based on race, social class, and gender; in turn, shaping our worldviews. Bridging cultural perspectives can create important new connections, relationships, and understanding. However, it also places the burden on those who are outside of the dominant narratives within academia and a broader setting. Research and thinking are culturally based and oftentimes, bridging worldviews is incumbent upon minorities (Walter, 2013; Wilson, 2008). Those who exist within dominant narratives in academia (often which are white and male) do not frequently question or explore their assumptions based on their cultural perspectives. I venture throughout this work to put into practice a methodology that reflects my positionality through approaches such as storytelling and metaphor. Throughout my work, I bridge my Western academic training with Indigenous knowledge systems and practical farming knowledge to explore the depth of my questions.

I leverage the aspect of my positionality as an orchardist researching orchardists to get at the heart of questions and conversations within that community. I describe and participate in systems of collaboration with cooperative inquiry and building networks. As a Xicana, I consider the importance of relationships between people and nature that are at the center of this work. I highlight this through the use of circle mentality and metaphoric mind through an exploration of seasonal cycles in a peach orchard.

The food movement itself is critiqued as being a monoculture of perspective, predominantly from white and middle-class people (Alkon & Agyeman, 2011). Too often, the dominant Euro-centric worldview assumes linear rationality and objectivity, and those adhering to other approaches must spend extra time and energy justifying their perspectives. Indigenous scholars emphasize racial and cultural influences to expand their approach, while also navigating Western paradigms. On the other hand, scholars who are vastly white and European have shaped the landscape of accepted research methodologies and are rarely expected to consider the cultural influences on their approach.

We are all cultural people, we all have lived experiences based on our genders, race, and social class that impact our worldviews. In modeling transparency in my positionality, I encourage other academics to incorporate a reflection on their unique epistemologies and axiologies that impact their academic work. I intend to weave the various components of my positionality as a Xicana, organic orchardist, woman, and academic without having to amputate any of those parts of myself to present this work.

Figure 1. Ripe peaches hanging in the canopy of the tree. Their orange, glowing, and spherical shape mirroring that of the sun poking through the leaves.

Summer Cycle

Summer in Hood River, Oregon is full of blooming orchards followed by an abundance of fruits. As you drive through the valley along the orchard-lined hills, the scent of fruit hangs in the air. Birds fly to and fro as they're chased off ripe fruits at each orchard. In July, it's harvest time for peaches here and by August we can hardly keep up. Dense Douglas Fir and Cedar forests grow right up to the edges of the valley. Bears living here come to feast on fruits while leaving their scat behind. I imagine the bears wandering in the orchard paths I walk.

I think about how the bear paths and corridors are altered to be replaced by more orchards. I also envision the people who have lived in these fertile lands for thousands of years. Stories from Yakama elders paint clear pictures in my mind. One elder shares a story in which her uncle lived in a shack in the forest, trying to resist being extricated from his traditional lands by colonization, holding on to the last hope of remaining where his ancestors have been for thousands of years. I look up at the hill by the orchard and see this image of history's impacts etched across the landscape.

If we keep traveling in the nearby orchards, we might notice wild asparagus by the road or in the orchards, waving their fern-like branches in the wind. These seemingly "wild" asparagus are naturalized asparagus which escaped planting. Many of the Japanese orchardists in the Hood River Valley planted asparagus and strawberries in the orchards to harvest while fruit trees came to maturity to bear fruit several years after planting. Some of their families are no longer here, having been forcibly relocated to internment camps. Yet, signs of them remain in the waving asparagus. This chapter reflects on the racialized history of agriculture, one based on a strong association between trauma and labor for BIPOC communities in the US and in Hood River, Oregon. I contrast how agriculture is both a landscape of traumatic memories and in a later chapter how it can be one of nourishment and healing.

This chapter goes beyond indulging in the sweet imagery of warm peach juice running down my chin in the long summer days. It connects this moment to the deeper, racialized history of agriculture. It helps explain why I choose to farm, and it also serves as an introduction to Indigenous ways of knowing by exploring how systems of native science can be understood. The summer cycle in this work holds space to introduce me as

the storyteller and to explain how my understanding of knowledge is refined through my culture. I intentionally use the seasonal cycles as a reminder that this work is centered around cycles and the circle mentality; many topics are introduced, and I circle back to braid the pieces together. We'll keep walking back across the same paths in the orchard again and again, each time noticing something different, making use of the seasonal cycles and the messages they have to share with us.

Harvest

My mother walks through the peach orchard, plucking ripe peaches off the tree. She heads down to the shaded creek to enjoy them. There's so much joy in my heart to see her enjoy the fruits of our labor and in seeing her rest and indulge in ripe peaches. As a first-generation Mexican-American woman, I've witnessed my parents working ceaselessly for family members to have our basic needs met. She can't understand why I would choose to farm and gives me a hard time for it, saying she wants a different life for me. I feed her peaches and try to explain how I'm in love with nature, in love with agriculture and it comes very naturally for me to grow food. Though the trees are mature (between 12-18 years), as we walk along the rows of peach trees we can reach most of the fruit since we prune them to be at a pedestrian height.

I also encounter a sense of surprise from my family and within the Mexican community around me because I'm choosing to work in agriculture. Summer is the easiest time to explain myself because of the abundant harvests I can share. Still, it's important to acknowledge that their doubt often stems from historical trauma and current inequities in agricultural systems for people of color that are the legacy of that history.

Racialized History of Agriculture

"The reconfiguration of racial capitalism in the early twentieth century hinged upon the exploitation of agricultural workers who were fired, deported or driven into cities when they tried to organize in defense of their interests" (Ortiz, 2018, p. 120).

While dancing in preparation for a ceremony, I look down at a friend next to me to follow his steps. I notice his legs have long scars along his shins. Those scars are from sharp thin machetes that come slashing down as he works shaping hundreds of pines a day for the holidays in the Pacific Northwest. I am reminded of why my family tries to convince me to get out of agricultural work—it can be dangerous. I understand why my mom has a hard time accepting that I want to work in agriculture. To her, images of abusive and traumatic conditions of women working in the fields of California are closely connected to agriculture. Ongoing harassment and rape of women farmworkers are an ever-present concern, several organizations such as Alianza Nacional de Campesinas and some Human Rights Watch interviews have concluded that most women in agriculture report sexual harassment (Poo & Ramirez, 2018). I hear people around me equate agriculture with unfair labor conditions and physical injuries such as the scars on my friend's legs.

The history of agriculture in the United States is one filled with traumatic events such as the mass genocide of Indigenous communities for access to land, followed by a period of Europeans enslaving African people to work in agricultural fields for the transatlantic trade system. With the arrival of colonization, Indigenous people in Turtle

Island (currently known as North America) were forced off their lands and either killed, taken to Christian missions, or displaced onto reservations. Indigenous people watched as the lands they had cared for over thousands of years were burned, disrespected, and destroyed over the course of a few years.

Devastating events of mass genocide of Indigenous people were justified by concepts of "Manifest Destiny" and the institutionalization of racism. The Homestead Acts offered land claims to settlers and led to the encroachment of lands held by Native peoples, further depleting their resources (Kumar, 2016). The United States waged war on Mexico for the expansion of Western territories, culminating in the signing of the Treaty of Guadalupe Hidalgo in 1846 (Estrada, 2009). The ceded areas accounted for almost half of Mexico's territory, in which Mexican people (many Indigenous Mexicans) were displaced from their lands, exploited, and not given the same political and land rights as Anglo Americans.

Once the land was cleared for European systems of agriculture, cheap labor was sought out in the form of slavery. Countless disturbing stories describe the conditions in which people in Africa were transported in horrific conditions by ship and further tortured upon arrival. The U.S. Supreme Court case of Dred Scott v. Sanford of 1857 declared that Black people were, "so far inferior, that they had no rights which the white man was bound to respect; and that the negro might justly and lawfully be reduced to slavery for his benefit" (Dred Scott v. Sanford, 1857). Oregon was one of the few Western states that allowed slavery. Within Oregon, Black Exclusion Laws created conditions in which Black people (whether free or enslaved) were legally banned from

Oregon. The enforcement was mainly through lash laws, that were later amended into forced labor, another form of slavery (NPS, 2021).

The legal coding of this devastating and brutal thinking has made its way to the present day through iterations that have only partially resolved these codes. For example, even after slavery was abolished with the 13th Amendment, laws called the Black Codes made it possible to arrest African Americans as criminals and force them into conditions of neo-slavery (Penniman, 2018). Law enforcement and white farmers colluded in arresting African Americans in groundless sweeps every harvest season to conscript them into unpaid labor. Remember too, lynchings were still happening well into the mid-1900s. Even more recent, the murder of Ahmaud Arbery in 2020 is attributed to this legacy of lynching which emboldened vigilantes to kill an unarmed young Black man (Taylor & Vinson, 2020).

Black Codes and other laws uplifted notions of white supremacy that formed the foundations of this country's agricultural system. The rationalization of racism made genocide, slavery, deportations, systemic injustices all possible and part of our history. The effects of this history are the genetic code that informs the injustices expressed today.

Harvest is associated with bounty, abundance, and life, but beneath is a somber reality. Currently, those who produce our nation's food are among the most likely to be food insecure or suffer from hunger. For people of color, working in the fields is often tied to memories of traumatic oppression due to the long history of genocide, slavery, and unjust labor conditions. There are contemporary issues that create unfair laws and conditions for farmworkers. Vestiges of racist laws continue to impact the current system

and leave many vulnerable to unsafe situations in agriculture (Poo & Ramirez, 2018). Federal Antidiscrimination Law, which is outlined in Title VII, has provisions that have led to the exclusion of domestic and agricultural workers from its protections. These exclusions are rooted in racist policies during the Jim Crow era that was aimed at refusing labor rights to formerly enslaved African-Americans. During this time the domestic and agricultural workers were largely African-Americans and people of color. Southern lawmakers' pressures led to New Deal labor policies excluding domestic and agricultural workers from the National Labor Relations Act and the Fair Labor Standards Act (Poo & Ramirez, 2018).

One of the results of this is that the law does not currently extend overtime protections to domestic and agricultural workers. To this day in 2021, federal laws do not require overtime pay for agricultural workers. On November 5, 2021, I attended a meeting with our State Representative, Andrea Salinas from District 38, along with farmworkers in the Hood River Valley in support of House Bill 2358 which would extend overtime pay requirements to agricultural workers in Oregon. It seems surreal that decades later, agricultural workers continue to be excluded from this labor protection.

The foundation of agriculture in the US relied on labor from enslaved people from Africa to clear land and produce crops. Since then, the bulk of the agricultural labor force has transitioned to be predominantly "Hispanic." A demographic distribution report from the USDA Economic Research Service in 2019 records that about 64 percent of agricultural workers are Hispanic, of which 57 percent are Mexican (USDA ERS, 2021). Women are also increasingly forming a larger part of the farm labor workforce in the US.

Farm work is considered one of the more hazardous jobs in the US labor market (Costa, 2021). About half of farmworkers are unauthorized immigrants, due to their status they have increasingly limited labor protections and suffer high rates of wage and hour violations. There is no accurate reporting on their wages due to their status. In addition, 10% of farmworkers are migrants employed through the H2-A temporary worker visa program who are paid even less than the hourly wage and are not permitted to change employers if they are offered better conditions or opportunities. The current structure of the H2-A visa program is flawed and rife with abuse of foreign and domestic workers.

As we walk through the orchard, consider the internalized historical trauma that BIPOC communities have been forced to contend with in the US. Consider the conditions of the people that harvest the very sustenance for our life. Later, in the Winter chapter, we will revisit this history from a perspective that highlights efforts to orient these narratives and patterns towards justice. For now, we turn to the unique history of agriculture within Hood River that sets the stage for understanding how presence is a methodology that can challenge these narratives.

Agriculture in Hood River

By the end of the twentieth century, Mexicans became the backbone of the agricultural labor force that sustained agricultural industries in the communities where they lived (García & García, 2005). Yet due to legacies of subordination in the US economic structure, very few Mexicans had ownership of any of that land. During World War II, an emergency agricultural labor act was enacted to bring Mexican laborers to the

United States. This act is commonly known as the Bracero Program and resulted in over two hundred thousand laborers coming North, of which several hundred lived and worked in Hood River, Oregon. My abuelito Rogaciano was one of those workers transported to the United States and though he was not in Hood River, he worked in California and Oregon in the later years of the Bracero program.

My abuelito shares few stories of his experiences as a Bracero worker but his nature is so jovial that he laughs it all off and makes fun of himself. Yet, I hear the undertones of injustice as he describes the living conditions and treatment he received in that experience. My memories of him stooping down to pick flowers for me are mixed with stories of him doing stoop labor as a Bracero.

The book "Memory, Community and Activism: Mexican Migration and Labor in the Pacific Northwest" has a section tracing the history of Race and Labor in Hood River (García & García, 2005) that helped me connect broad themes to this local history. Garcia & Garcia point out that this region did not see white settlement until the 1850's and 1860's. Most early white settlers relied on cattle, but the forests were gradually cleared to make room for agriculture.

Several changes expanded the capacity for growing crops in this region with deep fertile soils from a history of Ice Age floods. The first change was reliable transportation along the Columbia River to Portland, which was made through the building of the locks. The locks made it possible to bypass rapids along the Columbia River to connect boat transport from Hood River to the ports of Portland, opening many more markets for produce. The region became widely known for growing apples by the 1900's soon after the irrigation system, known as "the ditch," was built. The railroad further improved

transportation into Portland and sought out a source of labor that could be poorly compensated. Railroad companies solicited and attracted Japanese workers and families during this time of settlement. The Chinese Exclusion Act of 1882 along with the Alaska Goldrush had created a shortage of laborers willing to work for low wages on the West coast. So, Japanese families worked building a railroad into Hood River. Japanese migrants worked with lumber companies and eventually moved from renting to leasing land, and many became landowners.

In 1923, a Hood River politician introduced the Oregon Alien Law Act to the legislature which prevented those ineligible for citizenship to own land in Oregon. This meant that Japanese landowners had to put their landholdings under the names of their US-born children, or if not possible— then under the holding of a Caucasian contact. This law was an echo of the white superiority that fueled concepts of white supremacy over non-whites as it did with the history of Indigenous genocide and slavery. Later, this same logic was employed to prevent Mexican laborers from permanently settling in Hood River during World War II.

Historic and social events have not only led to trauma for Mexicans and BIPOC communities but have led to institutions and perceptions that are racist and discriminatory (Estrada, 2009). The context of this history helps me explain why my family and people from my Mexican community try to protect me from working in agriculture. Their fears are rooted in deep injustices within the institutionalized history perpetuated across our current food systems. These injustices have carved deep historical trauma that influences my experience of agriculture and shapes the approach of my research.

Historical Trauma and Ancestral Knowledge

"Trauma alters human behavior and associated thinking such that populations subjected to collective trauma have modified their strategies of socialization and survival as a way to protect themselves from external threats" (Gray et al., 2013, p.274).

The efforts of my family aimed at preventing me from going into agriculture are connected to the trauma experienced by our friends and family within the agricultural system in the United States. My mother gives me a worried look when I share that my harvest is coming up. To a large degree, she was responsible for me writing this thesis in order to qualm some of her anxieties; my mother wanted me to have other career options besides working in the fields. She reminds me that her parents and my father's parents worked hard so that we wouldn't have to work in agriculture anymore. The quote on trauma above describes how collective trauma can modify strategies of socialization and survival. My family's strategy has been to try to discourage me from a career in agriculture to protect me from the threats that Mexicans and other BIPOC communities experience every day in US agricultural fields.

I incorporate theories of historical trauma to understand the impacts of BIPOC communities within agriculture. It is clear from the history of agriculture that many Black, Indigenous, and people of color have experienced severe and prolonged trauma within the setting of agricultural fields. These experiences have led to strong associations between agriculture and trauma for BIPOC communities. Historical trauma is defined as observed intergenerational stress response to historical and social events (Estrada, 2009).

This understanding has been applied to contextualize the experience of Native Americans, African Americans, Pacific Islanders, and others.

Historical trauma is stress that can be perpetuated across generations, including negative health impacts and coping socializations for several generations after the trauma has occurred while also sometimes compounding with new traumas (Sotero, 2006). These traumas have a deep impact on how people perceive and engage with agricultural experiences and with nature. I hear and feel the doubt that my mother expresses in my choice to work in an organic peach orchard. Her strategy is to try and protect me from being subjected to any further trauma. This fear is shaped by the collective trauma experienced by people in our family, people in our history, and people in our community.

BIPOC communities have endured centuries of trauma within the US due to the colonial histories outlined in the previous sections of this chapter. Ancestral trauma is passed down and fuels current traumas day after day in the agricultural fields. However, despite the past few centuries of exploitation across Turtle Island, agriculture here has deeper roots stretching across thousands of years of Indigenous histories managing the land through diverse place-based philosophies and ancestral memories. My attraction to el campo has much deeper roots than the brief history covered here. It is encoded in deeper relationships to the land that connect across thousands of years of experiences. Rooted in a desire to learn more about ancestral place-based practices that stem from direct relationships and stewardship of the land.

This thesis forms part of a decolonial process to reconnect to Indigenous knowledge and ancestral memory within agriculture and academia. That

process highlights the importance of presence. That presence manifests itself as indigenous knowledge within academia, the presence of a Xicana farmer stewarding land and engaging with ancestral memory. It is seeing my family, Mexican, and BIPOC community feel supported and connected to the harvest, taking a moment to sit and enjoy a peach under the shade of the canopy. Presence as methodology (Minthorn et al., 2018).

Harvest Preview

While harvest is the most anticipated event of the summer—the literal fruits of our labor—I spend most of my time preparing every other part of the year for this climax. We're only harvesting peaches about half of the latter part of the summer. The rest of the time, we're diligently preparing and tending to the trees in hopes of a healthy crop.

One of the most time-consuming tasks for the whole year in the orchard is thinning. Thinning takes place in early June when the peaches are about the size of a ping-pong ball. At this time, they form crowded clusters of fuzzy green peaches. Volunteers often respond in shock when they learn just how many peaches we remove from the tree at this point. For most trees, we remove about 80 percent of all the fruit that sizes up. We remove the smallest fruits, leaving on the ones that look the strongest. We also separate each peach by about six inches from each other, so they're evenly spaced throughout each tree's canopy.

So here we are, spending hours upon hours twisting off thousands of ping-pong peaches one at a time by hand. They start out looking like little clusters of grapes and end up looking like well-decorated Christmas trees, except with tiny green fuzzy ornaments.

This step not only ensures that peaches will grow out to a good size but also protects the tree from tearing its own limbs off under the weight of the fruits.

Figure 2 Dounut peaches on the same day before and after thinning. The left image shows them clustered, the image on the right they are separated by about 6 inches from each other.

Every year for the past six seasons, our peaches have set out too much fruit for the tree limbs to bear. This is a great reminder of the reciprocity that exists between tree cultivars and humans. The term cultivar refers to varieties of plants that have been specifically cultivated by people over many generations for specific traits. Specific traits are conserved and selected for each plant generation, selecting for size, flavor, etc.

The cultivation process goes all the way back to the wild ancestors of crop plants, each with origin stories unique to their region and peoples. Peach trees evolved with people for thousands of years in a reciprocal relationship of give and take, starting out in the Kun Lee mountains in China. The people who grew peach trees dedicated themselves to good care, creating patterns of reciprocity. If the people paid attention and thinned

the peaches, they would receive large, sweet, and juicy fruit, and save trees from becoming damaged under the weight of too much fruit. If the peach trees paid attention and gave large, sweet, and juicy fruits, then their seeds would be spread, and the next generation would be well tended to. This reciprocal relationship has been carried out across thousands of years to the present.

This visual of reciprocal relationship between tree and human spanning thousands of years comes from both an evolutionary biology perspective and an Indigenous perspective. We will delve further into this idea of reciprocity in the following section along with an overview of Indigenous knowledge. While the focus will remain on Indigenous knowledge systems that I introduce next, I weave these with other ways of knowing including that of Western academic conventions.

Indigenization of Agriculture and Academia

"As it turns out, positionality, within an Indigenous methodologies framework, is not solely about an individual. Rather, it is connected to an individual in relation to others and to place" (Minthorn et al., 2018, p.xi).

It is important to repeat that we are all cultural people. We all have histories, ancestors, stories, and roots that shape who we are and how we navigate the world (Walter, 2013). This includes how we navigate knowledge and academia as well. From the very outset, even the academic topics we choose to investigate reflect those roots, those values. Knowledge systems are lived and put into practice daily (Brayboy & Maughan, 2009).

Indigenization and decolonization go hand in hand but reflect different approaches that are essential to distinguish. A colleague recently helped me consider that the term decolonizing suggests something that is "de-", a prefix that denotes removal. So, they ask, "if we are removing layers of colonial thought, what is left in its place?" Rather than focusing solely on removing, I take on their challenge to create and incorporate: to Indigenize. A focus pivoted to retracing, learning, recovering, and diversifying rather than simply stripping bare. The point is to develop a prominent presence of Indigenous-oriented solutions rather than a mere absence of colonial impacts. This centers a methodology of presence.

The ways in which different knowledge systems impact values and academic research can be hard to see if we are not familiar with knowledge systems other than our own. As a Xicana, my values are shaped by the Indigenous roots that are the basis of my Mexican heritage in addition to a myriad of Western cultural influences that have pruned back Indigenous roots in an effort to suppress their growth. Having gone through the US educational system, I've learned to navigate Eurocentric systematized frameworks, methodology, and values. In this section, I introduce how I endeavor to Indigenize my approach to academia by considering the methodologies of my thesis which hinge upon theories of building knowledge, or epistemology.

Epistemology

"[The] settings of academae do not often allow for the thinking of knowledge as the hybridized bundling of cultural experiences, as mainstream methodological traditions often encourage us to marginalize ourselves" (Minthorn et al., 2018, p.15).

The expansion of colonialism has not only dispossessed people of their lands but also of their ways of relating to land. This includes dispossession of culturally specific ways of thinking, seeing the world, and being. Epistemology deals with understanding our relationship to knowledge, including its nature, origin, and scope. Epistemology asks: How do I know what is real? and How do we acquire knowledge?

Relationship is a key component in epistemology because the way we come to understand the world around us is based upon relationships through which we communicate our own experiences while also learning from those with whom we communicate. If we think about it within terms of the harvest metaphor for this season, we could consider knowledge to be a peach pie. Epistemology would ask of that pie: Who made the pie? What methods helped them arrive at that result? How do we know this is a peach pie? And even How do we know that we know this is a peach pie?

Like a pie, different bakers have different processes at arriving at similar results, and there are different types of pies, with different ingredients, tools, and methods. This section introduces how cultural experiences shape the scope of investigating organic orchard mulches, starting with the foundation of how knowledge is obtained and reflecting on the ethics of knowledge. I incorporate theories and academic work from Indigenous scholars that broadens the scope of the types of ingredients, tools, and methods that can be employed to build on the knowledge of organic orchard management.

An Indigenous approach to knowledge appeals to a sense of relational accountability and requires the passing down of knowledge, since it is a responsibility of

those who obtain it. The goal is not to own or copyright knowledge but rather to pass it down and share it with others. Don Chelis, a Purepecha mentor within my danza community, reminds me of this every time we talk one-on-one and share stories. He'll say, "grabate esta bien" reminding me to "dedicate this one to my memory" so that I can pass it down to others in the way it was passed down to him and is now passed down to me. He rarely interprets or decodes the stories for me, even when I ask. This challenges the linear, analytic thinking my formal education has embedded into my ways of building knowledge. It's also a reminder that there are other ways of knowing that include metaphorical mind and circular thinking.

Opaskwayak Cree researcher Shawn Wilson presents a powerful demonstration of Indigenous epistemology in *Research is Ceremony* (2008). He goes beyond defending positionality to embodying this through structuring the book as a personal letter penned to his children. He exemplifies a methodology of presence in his work by making it personal. He also challenges methods for conducting interviews that rely on anonymity with relational accountability. He holds himself and others accountable throughout his work by recognizing names and relationships. Thus, he tells us exactly who made the pie and reflects on some of the tools and methods derived from
Indigenous research methodology.

In a similar way, the writing of Potawatomi professor Robin Wall Kimmerer embodies what Indigenous epistemologies can look like within academia. She braids indigenous wisdom, scientific knowledge and the teaching of plants together into a narrative that builds synergies between those ways of knowing. Both the writing of Shawn Wilson and Robin Wall Kimmerer have been deeply influential in their examples

of Indigenizing academic writing through the synergies they create when they incorporate distinct epistemologies.

Indigenous epistemology is echoed throughout this work by revisiting concepts of reciprocity that interconnect human, animal, plant, microbe, and the earth at varying scales. The notion of reciprocity necessitates that I ask what my responsibility as a researcher, as a steward of the land is throughout the seasons. I circle back on this in the Fall Chapter under the section of "Axiology" where I describe my process of cooperative inquiry and reciprocity. In this Summer chapter, however, I continue to introduce and Indigenous perspective on reciprocity that describes a reciprocal relationship between people and plants, starting with corn.

People of the Corn

Another way of knowing is through eating. Eating as becoming. The title "Eat Peaches 'til you Become a Peach" is lighthearted but with deep implications to Indigenous philosophy of epistemology and relationality. The line comes from deep reflection into the cultural tradition of referring to ourselves as the "People of the Corn", as people with Indigenous roots to Mesoamerica. This philosophy explains that we are really made up of the foods that we grow and consume. We grow the food, and the food grows us.

Each year as we eat more food from the land, we become more of that land. So, when I eat peaches from the orchard, I remember that I am becoming more of this land. More cells and components of my body are made up of peaches. The implications of this are sweet but also deep; this philosophy connects my body directly to the land and starts

to blur the boundaries of where I begin, and the orchard starts. Summer peach harvest is just one point in the cycle that keeps life flowing and transforming.

Corn represents a central component in the identity of Mexicana/o/xs. While there are a wide diversity of Indigenous peoples with unique and complex relationships with corn, the process of growing corn *itself* has profound social and ideological effects (Garza & Angélica, 2014). Growing corn itself has lessons which remind people of the importance of reciprocity. Corn as we know it now does not grow wild, rather it requires the careful handling of a human hand to open the husk, remove the grains, and plant them at a distance from each other.

To preserve corn, people must engage with various ways of knowing, or epistemologies. First, they must learn each step in growing corn which is typically through demonstration or reading in some cases. Then, people must learn how to store it and protect it from other hungry beings. Next is to learn how to prepare it. Finally, people must learn how to love corn. This step really cannot be learned by reading, it must be experienced. It is the step that actually preserves the corn. Today, many people of the corn in the US no longer grow corn. However, their love of corn is important knowledge that gets passed down through a tortilla, through a tamal, or even an atole.

In the example above, I present several ways of knowing of corn. Each of them plays an important role in preserving corn and the preservation of culture. I have had the honor and privilege to grow corn and save seeds the past 4 years. I think about how this corn builds the tissues of my body and I then build up the tissues of the corn when I plant it the following year. This lesson of reciprocity stretches further still beyond plant and human, as it involves the cooperation of the sun, moon, rains, animals and other entities

in nature. In the following section, I expand on how agriculture is a reciprocal (and sacred) agreement between plants and humans.

Reciprocal Relationship

Michael Pollan's book The Botany of Desire (2001) challenges the notion that human beings are the primary drivers of domestication. He uses a story of apples to make his point, though you can easily imagine it being about peaches. He argues that one of the purposes of sweet and juicy (energy-intensive) fruits is to attract humans and other creatures so they can spread seeds. According to Pollan, since trees are immobile as single units, they have to work to domesticate beings like humans to spread their seed. The trees are so good at this activity that they've managed to convince humans to invest immense amounts of resources and technology to grow trees and spread their seeds. Consider this curious image: humans domesticated by plants into working endlessly for the replication of plants.

Pollan's book covers not only plants that provide physical sustenance but also plants like tulips which are conserved and spread for their aesthetic value. Even plants without caloric benefits to humans are still compelling us to invest our time into tending them for future generations. By the end of reading this book, I was looking at my dog thinking: "Wait a second, who is domesticating whom here?" Thinking how she naps all day, going from sunny spot to shady spot, waiting for me to return home so I can feed her.

I take this idea one step further and consider that the direction of "domestication" is not unidirectional. It's not really a competition about who is controlling whom, or who is domesticating whom. A unidirectional sense of domestication, central to colonial

epistemologies, perpetuates uneven power dynamics and harkens to archaic notions of humans at the pinnacle of the food chain. It also provides a false sense of anthropocentrism in which humans are somehow above and outside the forces that guide other animals and life. Indigenous epistemologies know otherwise.

Rowen White, a seedkeeper of the Mohawk community, takes the concept of domestication described by Michael Pollan a step further in complexity. She describes the relationship as follows: both plant and people have given up a bit of their wildness, becoming domesticated in their reliance on care and nurturing in each other. This perspective shifts the focus from wondering who is controlling whom to thinking about how we are all interconnected and envisioning holistic systems of reciprocity.

With this in mind, imagine instead that as I'm interacting with my peach trees, I'm not just interacting with the genetics of the tree itself but I'm interacting with my own genetics. Furthermore, I'm interacting with the genetics of ancestors that have stewarded and been in relationship with these trees. From this perspective, the traits of the trees reveal what all the people that have worked with these trees have found beautiful and worth preserving. The same goes for the flowers around us, they not only hold information about themselves but they hold information about human-plant relationships throughout history. We will continue to revisit the concept of reciprocity throughout the seasons, going deeper each time into the myriad of meanings and perspectives on this term with regards to Native Science (Cajete, 2000).

Conclusion

Summer harvest is bittersweet. Sometimes while eating peach pie, I reflect on the conditions and racialized history that allowed peach trees to make it across the world from the Kun Lee mountains, into my orchard, into my hand, oven, belly, and maybe even powering the synapse that allowed me to connect those thoughts. Sometimes I'm just enjoying my pie, of course.

This chapter introduces me as the narrator along with the racialized history of agriculture which shapes my experience. I describe how my cultural protocols require me to consider reciprocity in all my work and endeavor to demonstrate that through my narrative. The themes of "Eat peaches 'til you become a peach' ", "People of the Corn", along with Rowen White's concept of mutual domestication between people and plants connects to a broader Indigenous philosophy grounded in reciprocity. These concepts also help us understand the different ways of knowing, or epistemologies that are important within agriculture and academia.

With the use of narrative, we traverse time scales to consider different ways of knowing and reciprocity by means of visualizing interconnections and blurring the boundaries between metaphor and plain speech. I weave together aspects of positionality, philosophy, and practice to provide a holistic view of what it means to engage in academic research as a Xicana, organic orchardist. By braiding culture and identity into my academic work and orchard, I put into action the methodology of presence that includes different ways of knowing. This sets the stage for my responsibility as a researcher and considerations for conducting interviews to engage in a collaborative inquiry with other organic orchardists in my community which I present in the next chapter.

Chapter 3: Fall- Knowledge Networks

As leaves fall off the peach trees with the arrival of cooler weather, there's a smell of decomposition that hangs in the damp air. The crescent-shaped leaves turn bright yellow and form yellow circles around the base of each tree as they twirl to the ground. There may be a few late peaches from rootstock trees falling to the ground fertilizing our soils. Next season's peaches are fertilized through death and decomposition in the orchard. Our shadows grow longer as the days grow shorter.

I think of all the peaches harvested this season; I envision each of them migrating from the orchard to find their new homes. Some carefully placed into the hand of a child, others suspended in sweet nectar in my pantry, and some decomposing on the ground and nourishing the soil and trees for next year's growth. One of our friends gathers wind-blown peaches to feed their pigs, while we also bury other fruit ailed by pests. All peaches are eventually transformed into fuel for human, animal, insect, plant, and microbial life. The transfer of energy perpetuates life cycles: I grow a peach, my friend picks this overripe peach off the ground, feeds her pig to grow, shares harvested meat with me which fuels me so I can grow more peaches. Round and round.

Figure 3 Photo of my peach orchard in the Fall with yellow leaves starting to blanket the ground (Image courtesy of the author)

Fall Cycle

The Fall season provides a backdrop of decomposition that highlights interconnection, cycles, and transformation. This chapter revolves around interviews I conducted with organic orchardists in the Hood River Valley. I engaged organic orchardists through interviews to investigate networks of knowledge while simultaneously building and strengthening those same networks. The exchange of information amongst organic orchardists occurs in cycles and complex webs. Themes from interviews include an analysis of networks and knowledge diffusion, informal and

formal knowledge, and sexual harassment. Additional emergent themes are grouped into sustainability, covering issues around climate change and finances.

I introduce the chapter through practical and metaphorical notes on compost. This includes notes about compost practices on my orchard, which I discuss with greater detail in the Spring chapter. I illustrate how the compost deity Tlazolteotl, from the ancient Mexica tradition, reveals Indigenous knowledge systems that mirror and add to contemporary Western perceptions of compost. Her story grounds this narrative in the circle mentality, offering insight into a perspective on cycles and interconnections based on a cultural understanding of duality.

Composting

Compost addition is one of the main nutrient management strategies I employ in the peach orchard. While carting wheelbarrow after wheelbarrow of rich, heavy compost across the orchard, it became increasingly relevant for me to examine the effectiveness of all my spent energy. This chapter presents a formal investigation on the appropriateness of that approach through a qualitative analysis of interviews I conduct with organic orchardists. Later on, the Spring chapter covers a quantitative analysis investigating compost as a mulch treatment.

We source organic compost for the orchard from a local producer that uses feedstock from industrial groups, fruit and woody material from orchards, land clearings, and yard debris. A large tractor-trailer dumps a heaping pile compost at the top of our orchard every Spring. The first year we ordered compost, we spread it using wheelbarrows and rakes. By the end of the season, we had barely covered a small portion

of the orchard in compost. Even though I now use a bucket loader, dump truck, and rakes, it's still a time-consuming task. Reasonably, I was curious to investigate the effectiveness and engage other orchardists in the process.

As I spread compost in the orchard, I recognized feedstock like cherry pits and pieces of wood. Seeing this made me contemplate how cherries get transformed into peaches. The cherry pits are transformed into absorbable nutrients and nourish trees, eventually becoming peaches. The peaches are eaten, broken down, and transformed into absorbable nutrients that nourish my friends and community. The cycling and recycling of nutrients and energy build a network between the microbe, the soil, the peach, the human, and the community.

Composting highlights the interconnection of life cycles linking death, decomposition, life, communities, and renewal. To illustrate this interconnection, I summon an ancient concept of compost from the Nahuatl tradition. Tlazolteotl is the Mexica deity/Goddess of filth, earth, and soil (Ladino & Téllez-Zenteno, 2016). She is described as the deity "of the black fertile and fecund earth that gains her energy from death and in turn feeds life". While she is highly complex and has many other associated qualities, these particular ones reflect her association to compost and cycles.

Ancient codices portray Tlazolteotl with symbols associated with life and death and often she is depicted in the process of labor. In Figure 4 she is giving birth to a child with the same type of headdress as her—a symbol of regeneration. This represents her giving birth to herself in another form. She appears to have two sets of hands on each side of her body. This is a compelling image— the hands hanging down are the flayed skin of a person she is wearing. This final intense detail illustrates the two

aspects of regeneration that connect life and death. Tlazolteotl embodies a profound concept of duality connected in time and place through her power to both consume and regenerate life simultaneously.

Figure 4. Image of Tlazolteotl giving birth. Her clothing is decorated in crescent moons and she wears the flayed skin of a human (Nowotny et al., 1974)

The concept of duality for Nahuatl traditions is deeply rooted in observations of nature. Unlike in Western concepts of duality that signal separate opposites, in the Nahuatl tradition duality is more akin to the idea of two sides of the same coin. Tlazolteotl embodies and represents the complex duality and interconnection between life and death. At one moment filth, the next moment nutrient, then plant, then human. Her image blurs the boundaries between life and death, she is both life and death. Round and round.

Prehispanic Mexica people developed a belief system deeply rooted in nature and understanding of ecosystems. Their notions of deities parallel complex concepts in ecology like homeostasis and conceiving of nature's ability to regenerate and auto-correct (Giasson, 2001). Tlazolteotl comes from the Nahuatl root word "Tlazolli" which means dirt both in the material and moral sense. Most of the analysis of her imagery focuses on her ability to transform and absolve people of moral transgressions or "filth" (Nowotny et al., 1974). However, she also symbolizes the transformation of material filth into nourishment for the earth and crops.

Like Tlazolteotl, compost is both life and death at the same time—some elements breaking down while also building up. This understanding of compost highlights interconnection and circle mentality through the recycling of food industry waste back into soil nutrients. Digging deeper into cultural images like that of Tlazolteotl, I recognize interconnections to cultural values that can also be described as systems thinking and network analysis. The concepts of cycling and duality brought up by the discussion on Tlazolteotl necessitate a preview of the axiology that informs the centering of positionality, which I include in the following Interview section.

The process of culling and transformation that takes place in the orchard or compost pile informs the analysis of interviews. The words and messages collected from interviews were composted, and out of their new pieces new combinations were born and manifested in the themes that follow. The information first passed through me, through a recorder, through the speaker of my computer, and over again through me. At each step, the components are transformed until they arrived on this paper and will be transformed by you in turn.

Interviews

"The interviewer's task is thus not that of fishing for the "true attitude of sentiment," but one of interpreting the subtle and intricate intersection of factors that converge to form a particular interview" (Briggs, 1986, p.22).

In a process of cooperative inquiry, I conducted interviews with three orchardists in the Hood River Valley to explore sources of information used to develop organic management systems. Originally, the scope of this thesis began with designing a mulch study comparing various organic mulch treatments. As I delved into primary research on this topic, I wondered how many other orchardists were reading primary literature on management systems. I attended several orchard tours to meet other orchardists in my area and was impressed by the amount of experimenting and creativity each person took on. A lot of the information generated through these individual on-farm experiments is largely uncaptured by the academic research I accessed in my literature review. I wondered how much of this information was shared and applied within farmer networks.

At this point, I decided to incorporate interviews into my thesis by investigating how orchardists develop their unique orchard management systems.

My interview questions were born partially out of a feeling that I had to fight tooth and nail to access basic information needed to learn how to organically manage a peach orchard. I wondered if other people also felt like they were flying by the seat of their pants learning to organically manage an orchard. Thus, my interview questions centered around how orchardists access information necessary to develop an organic management plan:

- **What does that process look like for others?**
- **Which sources of knowledge are most commonly used and valued?**
- **How can we improve on these processes for organic management to be more accessible?**

The main themes from these interviews center around sources of organic management information grounded around the question topics. Questions and details on interviews are included in Appendix A. Themes include local and farmer knowledge networks, and trust around knowledge sources. There are also emergent themes that orchardists chose to discuss in the open-ended questions. These include problems of sexual harassment and discussions about sustainability (both environmental and economic).

Thematic analysis was supported by personal experiences and stories from other orchardists/farmers with whom I interact outside of the interview setting. Some of the topics covered in this section address sensitive subjects, making it essential to uphold interviewee confidentiality. I intentionally combine and blend sources to protect

identities, especially with regards to sensitive topics like sexual harassment. Including stories outside of the interviews also presents a more complete perspective of my experience as an orchardist in connection with the community over time.

The word interview comes from Anglo-French entrevue, meaning to see one another. This language implies seeing eye-to-eye in a reciprocal meeting: inter-view. Conducting interviews fits well into my cultural values of reciprocity. Interviews facilitated building networks with orchardists and helped engage them in my process. Reciprocity is a guiding methodology for my research process which I present as the axiology of this work.

Axiology: Reciprocity

"Traditional Indigenous research emphasized learning by watching and doing" (Wilson, 2008, p.40).

Before we delve into the interview analysis, I include a brief discussion of the philosophy of values that informs this thesis. This section examines an intersection of positionality and philosophy by discussing Indigenous axiology. Axiology is the philosophy of value. It can be understood as the ethics or morals that guide the search for knowledge (Wilson, 2008)**.** Axiology serves as a measure to determine what information is worthy of searching for in the first place. It brings up questions about the responsibility of a researcher or community member. It asks questions like,

- **What is worth finding out more about?**

- **What means of obtaining knowledge are ethical, and what will the knowledge be used for?**

Engaging additional orchardists in my research process through the use of interviews addresses one part of the first question of axiology. I involved orchardists by asking them, “What other forms of information could benefit your organic operation?” More broadly, it is essential to reflect on who is asking the questions, who gets to decide what questions to ask, and what stories are shared.

Here I was in the Fall, spreading mulch and thinking about how I could share some of my results with others. As I took the time to read primary literature on orchard mulch studies, I felt a responsibility to share some of that and to connect with others. To address the question of whether this mulch study was worth finding out more about, I decided to go beyond reviewing academic research on the topic. I aimed to capture some of the content and information outside of that with interviews.

The second question that axiology asks regards ethics and the responsibility of the researcher. Within Indigenous axiology, these are centered around community and relational accountability. So, as I spread mulch in the orchard and had a sense of responsibility to share this, I reflected on how that arose from my community-oriented traditional values. Through this understanding of axiology, reciprocity encompasses relational accountability of people in the orchard community and to the broader ecological community which includes other people and species. These are the scales that I consider when thinking about what knowledge can be used for. Thus, I include sections on history, philosophy, and Indigenous knowledge throughout this thesis, all emerging from a seemingly simple mulch study.

In Indigenous axiology, reciprocal is ethical. Centering interconnections and networks is reflected in the story of Tlazolteotl and within Indigenous axiology that guides the work of Indigenous academics. From the introductory story of my abuelito giving his corn to a customer who feeds him atole, to the philosophy of the "People of the Corn", complex networks develop like the one of a compost microbiome in Figure 5. Different scales of reciprocity are woven together as we zoom in and out of the orchard; zooming into the microbes then zooming out to the community, further out to global peach research, still further out to consider Indigenous axiology.

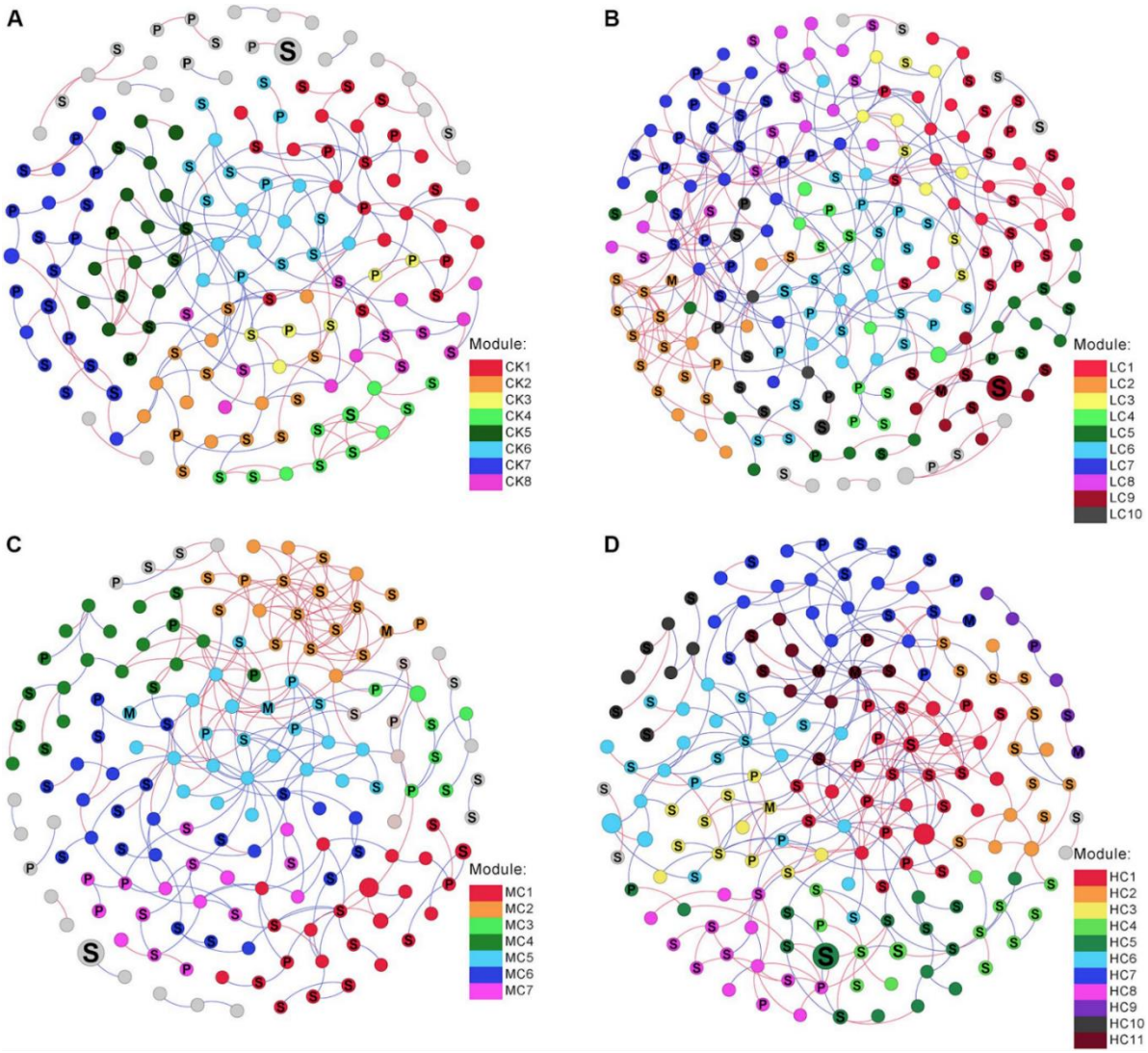


Figure 5. Network analysis of fungal networks of soil with varying levels of compost application (Yang et al., 2019).

My research analysis extends beyond the dominant research frameworks of the last 500 years, incorporating knowledge systems passed down over millennia on this continent, reclaiming concepts like that of Tlazolteotl in the Nahuatl tradition to help explain duality, reciprocity, and interconnection. My approach is also rooted in layered physical scales. Knowledge networks exist simultaneously across time scales. From the

daily tasks of managing nutrients by applying compost, to the passing down of traditions and knowledge from generation to generation.

I considered how to engage in reciprocity while asking orchardists in my community for their valuable time for *my* interview process, *my* thesis. Rather, by considering reciprocity, I endeavored to include *them* in a process of cooperative inquiry.

Background/Practice

When I arrived in Hood River, not only was I navigating a new community, but I also had to figure out how to run an orchard with my partner. We started with the basics of pruning, thinning, irrigation repair, harvest, and tractor driving. We then began developing our own organic management plan (the orchard was previously managed with a non-organic approach).

As a new farmer, it was intimidating to know where to start. I considered using some of the leftover chemicals from the previous orchardist, thinking I didn't want to shock the trees with a complete overhaul of their routine. I read the labels on some of the bottles: Indar, Captan, M-Pede, and Thionex. I was somewhat surprised to see that the labels on the chemicals stated so clearly that they had "neurotoxic effects" directly on the bottle. To think that many farmers continue to use them liberally!

The safety sheet for Thionex states that it is "fatal if inhaled", absorbable through the skin, and has a physician's note that it may cause convulsions, has no antidote, and that stomach pumping is contraindicated due to the damage it would cause to the gastric lining (Makhteshim, 2015). It is probably carcinogenic to humans and "very toxic to

aquatic life." Thionex is a chemical applied directly to fruits and other food crops even though the label states "do not contaminate food or feed," nor feed animals crop residue (leaves, stems) of plants that have been sprayed.

In a similar vein, Indar states not to feed culled fruit to animals or allow them to graze in the orchard spread with Indar (Dow Agrowsciences, 2015). In addition, studies show that it interferes with reproduction for females in animals. After reading this, I had little doubt about transitioning into fully organic straight away. Even if it meant I could potentially put my trees at risk, it far outweighed putting myself and my community at risk.

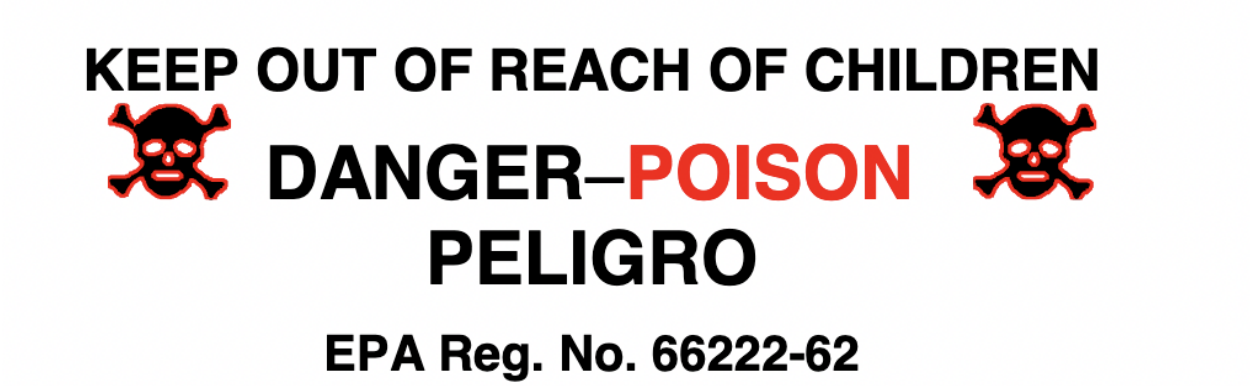


Figure 6. Label warning from Thionex Safety Sheet for Apples (Makhteshim, 2015).

The decision to discontinue the use of these chemicals in the orchard was informed through concepts of reciprocity and reciprocal relationship. I considered the health of the community that would consume the peaches and the health of the ecological systems that the orchard is part of. I considered the creek that runs through the lower

orchard, the forest edge within sight, and visiting toddlers trying to eat half-rotten peaches when they wander off into the peach orchard.

Fall is a time to revisit management practices and an opportunity to spray antifungal agents to prevent diseases from carrying over into the following season. While I've committed to using organic options for this, there are still important effects that organic options can have on the environment that I continue to consider. Reviewing the non-organic chemicals led me to wonder how other orchardists develop management systems that either include or exclude dangerous neurotoxins. I recalled how little certainty I felt while transitioning the orchard to organic and some of the doubt that was generated by reaching out to the local Oregon State University Extension service.

It was my first year managing an orchard, so I called the local Extension service to connect with them on my management plan and learn about common pests in the region. The area extension agent started by telling me that peaches did not grow in the Hood River area. That specific person was very pessimistic that peaches would grow well at all and that it was unrealistic to consider doing so organically. They also had very little advice on how to manage an orchard organically in the Hood River Valley. This experience was part of the impetus to investigate how other orchardists in the Hood River Valley obtained the necessary information to manage their orchards organically.

Thematic Analysis Results

The interview process addresses one of the central questions of this thesis: **How do organic orchardists in Hood River acquire knowledge to develop their organic management plans?**

My interview questions centered on exploring how organic orchardists access information to develop effective management plans. All questions are listed in Appendix A , along with a discussion on methodology and methods. Themes were coded from interview discussions and organized into two main categories: Sources of Information and Emergent Issues. While themes were identified based on interviews alone, the analysis includes stories and anecdotes from the farming community gathered outside of the interview process as an added layer of confidentiality regarding sensitive topics. Themes identified are as follows:

1. Sources of Information
    a. Knowledge Networks
    b. Informal Knowledge
    c. Harassment Limiting Access
2. Emergent Issues
    d. Climate Change
    e. Finances

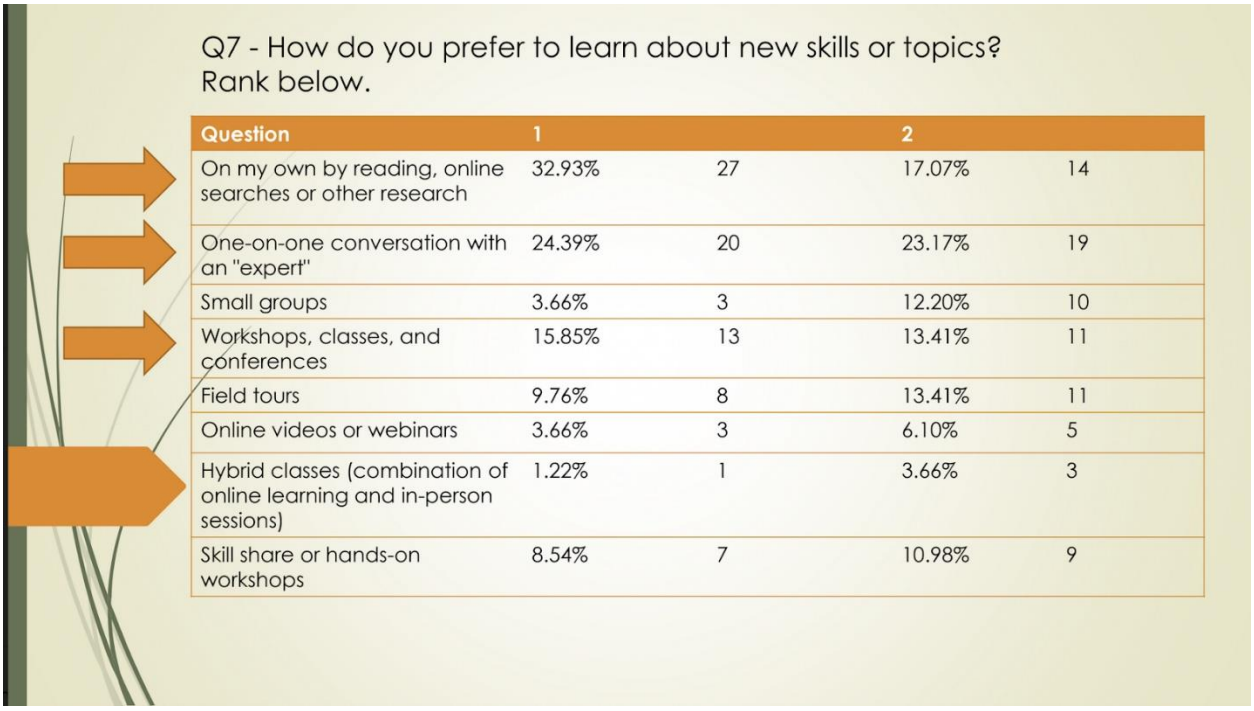
Sources of Information for Organic Management

Overall, orchardists referenced a wide variety of informational sources to inform their practices. Everyone interviewed mentioned getting help from neighbors or other farmers, and there was mention of accessing information online, in books, and conferences. To broaden my scope, I initially reviewed data on how farmers in the Columbia River Gorge prefer to learn. This information was provided by a key informant employed by the Oregon State University (OSU) Extension Service at the time. The data

was obtained from a broad survey sent out to 113 producers in the Columbia River Gorge, which encompasses the Hood River Valley.

The producer survey was a collaboration between OSU Extension Service, Washington State University, and the non-profit organization Gorge Grown Food Network in 2017. It is the most recent needs assessment available for this region. The aim was to support all three organizations with allocating resources and services to producers in this region. They broadly define producers to include farmers, orchardists, meat producers, timber industry, and others. The majority of participants were vegetable farmers and orchardists.

The most salient question from this survey was one that asked how producers prefer to learn about new skills or topics. As shown in Figure 7, producers ranked "on my own by reading, online searched or other research" as the most common approach. This preference was followed by "one-on-one conversation with an 'expert'" and "workshops, classes, and conferences". The lowest-ranked answer was hybrid classes (online and in-person).



Q7 - How do you prefer to learn about new skills or topics? Rank below.

Question	1		2	
On my own by reading, online searches or other research	32.93%	27	17.07%	14
One-on-one conversation with an "expert"	24.39%	20	23.17%	19
Small groups	3.66%	3	12.20%	10
Workshops, classes, and conferences	15.85%	13	13.41%	11
Field tours	9.76%	8	13.41%	11
Online videos or webinars	3.66%	3	6.10%	5
Hybrid classes (combination of online learning and in-person sessions)	1.22%	1	3.66%	3
Skill share or hands-on workshops	8.54%	7	10.98%	9

Figure 7. Results from a survey of Columbia River Gorge producers regarding sources of information for new skills.

A limitation of this survey was that it failed to cover all potential responses since it lacked an “other”/write-in option. However, it was insightful to preview how informational sources were ranked by producers in this region before I began my interview process. My interview questions were specific to organic orchardists and delved deeper into informational sources.

The subsection below devoted to sources of information begins with describing literature on knowledge networks and how several principles are reflected through the interviews I conducted. Followed by a discussion on the prevalence and implications of formal and informal knowledge.

The following eight sources of information were mentioned on more than one occasion in my interviews:

- Neighbors or fellow orchardists
- Youtube.com
- University Extension Service (Oregon and Washington State Universities)
- Books
- Research studies
- Conferences
- Informal and Formal groups
- Their own experimentation

Knowledge Networks

"Poor links and interchanges between scientific and practitioners' life-worlds and knowledge, and the asymmetry in powers and interests complicate the application and implementation of scientific knowledge in practice and the integration of farmer's perspectives in scientific research" (Šūmane et al., 2018).

Literature on social network analysis of farmer knowledge exchange delineates the following general principles: farmers value knowledge from persons rather than people in specific roles, they value farming experience, and develop knowledge through empiricist rather than rationalist techniques (Wood et al., 2014). These three principles are reflected in the trust orchardists expressed during the interviews I conducted, as I describe below. In addition, Wood and colleagues claim that given the scale and complexity of agricultural problems, agricultural knowledge can no longer be solved by linear transfer models. Linear transfer models are those where specialists

produce technological answers, which are passed on to farmers through extension agents. A systems theory approach supports network facilitation as an alternative model.

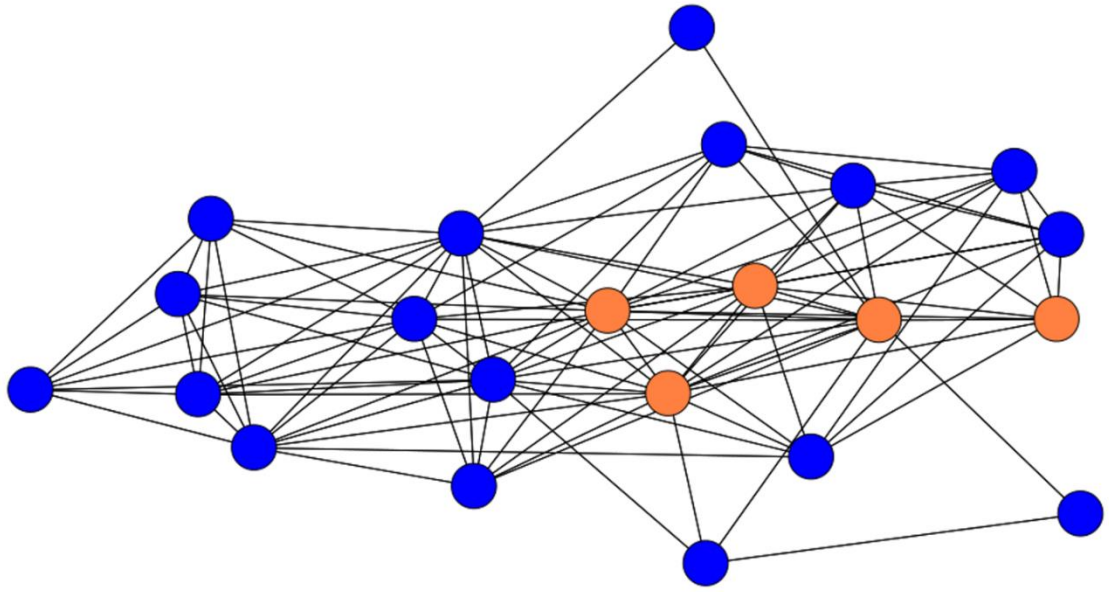


Figure 8. A network representation of how knowledge was shared between farmers and scientists. Scientists are represented by orange circles, and each blue circle represents a farmer (Wood et al., 2014).

This study on knowledge diffusion by Wood et al. reveals that the diffusion of knowledge of a science experiment forms complex networks that mirror preexisting social networks. Knowledge is exchanged between farmers and scientists in a non-hierarchical manner. Rather, diffusion of knowledge within agriculture is shaped by interpersonal relationships based on trust and social proximity. Figure 8 is a visual representation of networks of knowledge formed between scientists and farmers in the Wood et al. study. Clusters formed around interpersonal networks, rather than being centered around scientists (represented by orange circles) amongst the farmers (blue

circles). In a linear model, the orange circles would be at one end, while the blue circles would be at the receiving end. However, this is clearly not the case.

The principle that farmers value information from persons rather than roles is reflected in orchardists' interviews. All orchardists made mention of relying on their neighbors or people within their social networks for information on orchard management. In addition, trust for sources was not necessarily tied to whether the person or entity ascribed to organic practices. In this case, even if the person did not fill the role of "fellow organic orchardist", they could be viewed as a trusted and valuable resource within their network.

In an interview I conducted, an orchardist commented on learning from non-organic orchardists around him saying, "You were asking about my source of information and well, really most of it has come from the conventional side, and then I just change it to fit organic". This acknowledged that trust was not necessarily attached to whether the individuals or organizations ascribed to organic practices or not. There were other factors that influenced trust for those sources beyond how specifically relevant the information was.

It is worth mentioning that there are few organic orchards relative to non-organic orchards in the Hood River Valley. As a result, organic orchardists may be opting to employ a replacement model approach to organic management since they are able to observe other orchardists in the region having success with similar non-organic models. This intersects with the second principle that farmers value farming experience. Orchardists may be more likely to trust sources from those who have been farming for longer, whether they are organic or not.

The final principle on knowledge networks is that farmers develop knowledge through empiricism rather than rationalist techniques. Interviews and my personal experience support the fact that farmers like to experiment on their own farms. Orchardists value seeing results for themselves. However, it is clear that orchardists also employ rationalist techniques in developing their knowledge. For example, the former case where an orchardist modifies a non-organic approach into an organic approach can be considered a rationalist approach in part because it makes use of deductive reasoning.

There is evidence that the diffusion of new farming techniques is deeply embedded within existing social networks that are non-hierarchical and non-linear. These are patterns that are well suited for long term planning and collective problem solving. My interviews confirm that communication about management practices occurs in everyday interactions within established social networks (Leeuwis & Aarts, 2011; Wood et al., 2014).

Informal Knowledge

In another study on farmer knowledge networks, Šūmane et al. concluded that diffusion of knowledge is enhanced with informal knowledge by providing experience-based knowledge that is practical, personal, and locally relevant (Šūmane et al., 2018). I draw on this study to investigate experience-based knowledge, which can be referred to as both *local knowledge* or *farmer knowledge*. Local and farmer knowledge are often categorized as informal sources of knowledge. Local knowledge is defined as knowledge that incorporates unique local factors such as environmental, economic, social, empirical,

and even spiritual. Farmer's knowledge is a subset of local knowledge and is linked to practical experience and skill.

Informal knowledge is often compared to formal knowledge in a binary that delegates informal knowledge as subordinate. One of the consequences of this is that farmers give less weight to their own experimentation and knowledge. This binary between informal and formal knowledge is an oversimplification, as the distinction between them forms more of a continuum between the categories (Agrawal, 1995). However, dividing them into these loose categories helps address a subset of knowledge that is often relegated as subordinate. In addition, considering the concept of duality as discussed above in the section of Tlazolteotl helps us understand how these concepts can be thought of as two sides of one coin. Table 1 presents differences and commonalities between informal and formal sources of knowledge.

Table 1.

Differences and commonalities between informal and formal knowledge

Table 2
Differences and commonalities between informal and formal knowledge.[11]

	Informal farmers' knowledge	Formal agricultural knowledge	
		Academia	Industry
Source	Farmers' experimentations and practical experiences on the farm	Research stations	Research stations
Ownership and certification	Practitioners, farmers, local community	Scientists	Specialists, scientists
Approach	Holistic	Complexity	Fragmentation, specialisation
Transferability	Locally specific solutions	Standardised and locally specific solutions	Standardised decontextualised solutions
Transmission and access	Exchange with peers, passed through generations	Peer-reviewed articles, conferences, formal education	Formal education, training groups, professional literature

Source: Authors' compilation.

Note. Table with differences and commonalities between informal and formal knowledge (Šūmane et al., 2018).

The industrialization of agriculture has diminished the role of local farmers' knowledge due to the spread of productivist logic and standardized solutions (Šūmane et

al., 2018). These are a result of global transformations in agriculture that favor scale enlargement, specialization, intensification, and mechanization. The increased standardization within agriculture has led to the concentration of authority over knowledge in the hands of fewer experts (Šūmane et al., 2018). These models create a power dynamic imbalance by assuming farmers are passive recipients of knowledge that is fed to them by scientists or specialists. This latter approach can develop into a disconnect to orchardists' needs and potentially neglect region-specific social and physical factors.

Hood River Valley orchardists had high regard for local and farmer knowledge. All the orchardists I interviewed shared they conducted informal on-farm experiments each year. Some of the informal knowledge that was being generated from on-farm experimentation was a result of formal knowledge that orchardists read about or heard in conferences they attended. In interviews, organic orchardists mentioned they exchanged information with each other by connecting with neighbors, asking friends, and attending events where they could meet with other orchardists in the area. They had a high level of trust for people in their social networks, especially if they were able to physically see the results of their approaches. Organic orchardists in the Hood River Valley have formed networks to exchange local and farmer knowledge with peers.

One example which aims to address the power imbalance in the flow of information is an agricultural needs assessment. Earlier in this chapter, I introduced a survey in Figure 7. of producers in the Columbia River region that approximates an agricultural needs assessment. An agricultural needs assessment is typically conducted with the help of farmer feedback to identify the needs of farmers. It typically includes

meetings and surveys as a way to gather information about what farmers care about and need in the region. A great example of a thorough assessment is the 2017 South Puget Sound Agricultural Needs Assessment (Bramwell et al., 2017). The needs assessment information is meant to be used by extension agents to facilitate programs addressing agricultural needs and allows for a decentralized approach to solutions. Their reports include an open-source version of the assessment report so that other governments, organizations, individuals, and others can be involved in addressing the farmer-identified needs.

Another approach to engage farmers in decentralized forms of building knowledge and finding solutions is participatory action research (PAR). This is an approach that promotes the participation of communities affected by research. Within this scope, a PAR approach can be one which includes orchardists in identifying what experiments are worth conducting and including orchardists in other aspects of the research process. For example, in 2018 I attended the Ecological Farmers of Ontario Association (EFAO) Conference, which included a Farmer-Led Symposium prior to the event. The symposium was an excellent example of decentralized and collaborative knowledge generation that was specific to local farmers' needs in the region. In this program, individual farmers chose on-farm experiments pertinent to their needs and carried out an experiment with the technical support of statisticians and experiment design specialists. The symposium even provided posters for farmers to present their work to other farmers attending. This example of PAR combined informal and formal knowledge to solve local challenges.

In a desire to decentralize some of the knowledge-generation process, I included orchardists in my research method through the use of interviews. It was an opportunity to cooperatively identify our main sources of information that support organic orchard management plans. In the process of identifying the focus of my thesis, I relied on informal knowledge that came from my experience as an orchardist grappling with developing an organic orchard management plan.

Harassment: Farming While Femme

A study on immigrant farmworkers revealed that of 150 Latina women, 80 percent of those studied had experienced sexual harassment (Waugh, 2010). Waugh also stated that about 35 to 50 percent of women experience sexual harassment in their working lives overall. In that study, Waugh identifies three main forms of harassment: (a) gender harassment which includes generalized sexist comments and behavior; (b) unwanted sexual attention; and (c) sexual coercion. Waugh concluded that sexual harassment is used by men to control and intimidate women.

In half a decade of farming, I have witnessed sexism presenting a barrier to women in my community—ranging from instances of men questioning authority or ignoring suggestions made by women, all the way to full out sexual coercion. A fellow farmer spends hours upon hours screening potential employees to make sure women on her team feel safe and supported due to her own negative prior experiences. These are hours that could be invested in growing more food for the community or resting at the end of a busy harvest day.

In my community, women leaders share stories of having to deal with unwanted advances from men while trying to establish contacts for selling products. Not only do

women often have to spend extra time and energy to deal with these forms of harassment, but they are also paid less to do the same work relative to men. The number of women in agriculture is growing yet, “US women farm operators receive 61 cents to the dollar made by men,” making farming one the occupations with the widest pay disparities (Harrison, 2018).

Women farmers in the Hood River Valley are experiencing unwanted sexual attention, and that affects how they run their businesses. A woman using her personal phone to connect with customers on orders has received unwanted advances from several business contacts. While trying to run her business, she has had to balance her safety and success as a farmer in ways that are completely unfair and abusive. In one instance, when she turned down a man who was putting forth unwanted advances, he cursed at her and intimidated her.

Sexual harassment can be used as a means to withhold information and can escalate to the point of sexual coercion and blackmail. Another woman shared she had reached out to ask for technical support only to find herself intimidated by a man who tried to convince her to sell him her land and provide sexual favors. Not only did she have to endure the harassment, humiliation, and stress from this person at the time, but also found out later that the person had withheld useful information that could have benefitted her business.

It is entirely unfair that for women to navigate and maintain positive working relationships, we must spend extra energy to protect ourselves from sexual harassment and intimidation. In addition, it represents a break in the flow of information in farmer-driven networks, where women have less access to information and markets due to sexual

harassment threats and discrimination. Further studies should investigate how women in farming access management information and other farming resources.

Systemic sexism and racism in agriculture persist and are major themes that influence my experience as well as that of my family and friends. These are also reasons why I farm: I want to normalize women and people of color having positions of leadership within agriculture.

Emergent Issues

The second section of thematic analysis focuses on emergent themes within interviews. These themes were not part of the specific focus of the research questions encompassing knowledge diffusion. Instead, they emerged during interviews and express relevant issues to the experience of the orchardist in the Hood River Valley. The analysis of emergent themes is centered around a concept of sustainability that considers ecological and economic factors that affect the sustainability of agriculture in this region.

Climate Change

Incorporating sustainable agricultural practices in the Hood River Valley is essential, not only because the economy relies on agriculture but because there are already signs of environmental degradation and water scarcity that can be exacerbated with climate change. Severe droughts in Hood River Valley have already led to a lack of water for users in the latter part of the season. In 2015, Governor Kate Brown officially declared a drought emergency in Hood River (Mulvihill, 2015).

The US Department of the Interior, Bureau of Reclamation conducted a study of the Hood River basin in 2015, and found that already 40% of flow from the Hood River

is diverted for consumptive use during peak irrigation in the summer (U.S. Department of the Interior Bureau of Reclamation, 2015). They projected that demand for overall potable water use would increase by one third by 2050. The primary source of surface water and groundwater comes from snowpack and glaciers on Mount Hood, which are susceptible to increases in temperature according to climate change projections.

Climate change comments from orchardists were centered around fears of uncertainty about the future conditions of farming. One quote from my interviews summarizes this:

> *"I don't know what's going to happen to the earth and a farmer is going to feel it in so many ways and it's just this underlying kind of dread for the beautiful earth, and so that's part of the reason I'm in this mode of -- okay I'm just going to balance my life out a little more and not look towards the future because we might not have one"* (Interview Participant).

The quote above came as a surprise during the interview. The question that elicited that answer had to do with how orchardists update their management plans as they acquire new information. I did not expect "information" to be interpreted to include environmental information. In retrospect, this interpretation of "information" reflects the deep interconnection farmers develop with land and place. It demonstrates how farmers connected both informal knowledge based on personal experience with broader formal concepts of climate change.

Orchardists in the Hood River Valley are already feeling the impacts of water limits. A few of my neighbors who are orchardists have warned me about potential water restrictions. They have shared that the year before I took over the peach orchard, many of

them faced watering restrictions that put their crops at risk. In an interview, an orchardist even describes climate adaptation plans they have in mind for dealing with climate change, involving strategies to deal with hotter summers.

Financial Burdens

With a population of only 23,000, Hood River County is one of the leading pear producers in the nation and has a dedicated research station for fruit trees just outside the city limits run by Oregon State University Extension (Mid-Columbia Agricultural Research and Extension Center, 2013). Hood River has a strong agricultural presence that has contributed to the strength of its economy (Josh Lehner, 2012). In addition, "[t]he economy of Hood River County is primarily dependent on irrigated agriculture" (U.S. Department of the Interior Bureau of Reclamation, 2015). While preserving agriculture in this region has important implications for the economy, considerations on environmental impacts go hand in hand.

Access to information is only one component of running a successful organic farm. Orchardists in the Hood River Valley reminded me how finances play an important role as to whether they're able to implement the information they acquire. To be sustainable, organic agriculture also has to be profitable. A study that looked at Oregon farmers' motivations and obstacles identified some of the main obstacles to transitioning to organic were: cost of labor, recordkeeping requirements, cost of organic certification, and weed management (Lloyd & Stephenson, 2020). Two of the four obstacles could be attributed to costs.

A cost analysis study comparing over 90 percent of the apple production in the US revealed that while costs are higher to operate an organic apple orchard compared to a

non-organic orchard, organic orchards have overall higher profits (Taylor & Granatstein, 2013). Other global studies on organic agriculture also support the finding that organic agriculture is significantly more profitable when compared to non-organic agriculture (Crowder & Reganold, 2015).

Although the extensive studies above confirm that organic farming can be more profitable, one interview participant expressed concerns by saying, *"I see a problem with organic: that a lot of people don't think it's worth it."* Another participant expressed personal challenges in affording the organic management practices they wanted to implement in their orchard stating, *"Yeah I've got all the [informational] resources, I just don't have the money or time."* Some orchardists expressed they felt confident in the practices they could implement to manage their crops, but that sometimes they could not afford the materials or the time to implement those practices.

Finances play a role in the practices orchardists implement after they acquire information on management practices. The interview process broadened my scope, noting that access to information was not always the limiting factor influencing management practices. Even though reports showed that organic farming could be more profitable, orchardists in the Hood River Valley expressed that they could implement new ideas of better practices if they had more financial resources, rather than informational resources.

Conclusion

The imagery of decomposition in the Fall is an apt illustration for the analysis of networks and knowledge diffusion. Representations of non-linear interconnections and cycles are recurrent in the images included of Tlazolteotl, compost fungal networks, and

mapped farmer knowledge diffusion networks. Indigenous axiology based on reciprocity highlights the scales at which interconnections exist, whether they are between microbes, humans, ecosystems, or any combination thereof. We arrive back at the imagery of decomposition and cycling to address the question presented in my introduction:

How do organic orchardists in Hood River acquire knowledge to develop their organic management plans?

The question itself expresses cultural protocols of endeavoring to engage in reciprocal relationship by seeking collaborative learning with my community, rather than attempting to seek "answers" in themselves. I strive to embody an Indigenous axiology centering reciprocity through the imagery and analytical approach that weaves together various scales and types of information. This too is what orchardists in the Hood River Valley demonstrate in interviews and shared stories. They demonstrate that they incorporate "information" for their practices that come from neighbors, the environment, and various formal and informal sources that build on the possibilities for organic management. Organic orchardists also remind me that there are important intersections to consider which can limit the flow of information-to-practice, including issues of harassment, finances, and climate change.

An ethics of reciprocity mirrors the complex networks and systems thinking as opposed to the linear, or hierarchical models of knowledge transfer which have been historically used in agriculture. Agricultural needs assessments and participatory action research are two ways that can create more robust systems of knowledge generation and exchange between formal and informal settings.

Chapter 4: Winter- Rest as Revolution

The most restful period on the orchard is from November to late February when trees are dormant and much of the outdoor work stops. It's a time of stillness and gestation of fruit buds and ideas. For me, it's a time of planning, accounting, reflection, and preparation. As snow blankets the slopes of the orchard, sometimes I take out my skis to knock down withered peaches that have somehow held onto the branches. I clear them out of the orchard to reduce the spread of spores that can infect the fruit in the following seasons. The branches are entirely bare of leaves, their energy transformed to be stored in the roots until Spring. I walk along the frozen alleys in the orchard and see little scales on the tree branches, each scale a bud already holding next summer's peach. They patiently wait for the seasons to change, transforming in sync with slight changes to the tilt of the Earth. Every year, I'm still in awe of the immense transformation of a tiny scale on a branch into a big, juicy peach. This time of cold and rest is critical for the development of a peach. As I rest along with the dormant trees in winter, I have time to reflect on the importance of rest for peaches and people.

Figure 9. Winter in the peach orchard.

Winter Cycle

This chapter reflects on the stillness of Winter to highlight the importance of rest. The imagery invoked is of leafless trees in the cold winter months. When in fact this is a time for them to store up their life force in roots, preparing to renew themselves in the coming seasons. The physiology of trees reminds us that a rest period isn't merely about surviving but that it is an essential component of thriving. We will explore fruit trees' physiological need for "chilling units" to renew their canopy. This will provide a

framework from which to understand the importance of stillness and reflection needed to transform systems of oppression in agriculture.

By making use of cycles and circular thinking, I revisit the topic of racialized history of agriculture introduced in the Summer Chapter. Now that the reader has had time to sit with those historical facts, we will expand on ancestral and contemporary wisdom that offers a change to that narrative. Transforming the narrative from one based on oppression, enslavement, and genocide, to one that centers restoration, equity, and healing. I weave in published interviews of three contemporary activists and end with three more stories of women who have had profound influence in the history of agriculture. Their actions demonstrate how to engage with uprooting racism through healing historical trauma.

As soon as the trees start to break dormancy, we start pruning back branches. In the pruning section, I revisit the importance of relationship between tree and human. I consider how this human-tree relationship is a type of knowledge network, a topic introduced in the Fall Chapter. A network of knowledge that extends outside of the human-to-human interactions and looks to the networks of information that exist between human and tree.

Dormancy: Chill Factor

Chill factor is a measure of the length and intensity of cold required by a tree for flower and leaf buds to reach complete development and rest. Chilling units (CU) are a metric used within agriculture to measure the duration of chilling temperatures in a season. The CU is calculated by assigning values to different temperatures that account for the length of time and intensity of cold. Fruit trees have specific CU requirements in

order to produce fruit the following season (Okie & Blackburn, 2011). It is possible for fruit trees to not receive enough time and/or intensity of chilling temperatures, leading to reduced fruit yields. It is also possible for trees to not grow back at all in the spring if they don't receive the necessary CU.

Peach trees are particularly sensitive to CU. Peach varieties must be planted in regions where they'll receive the necessary CU so their buds can break dormancy. There is a wide range in the requirements of CU based on the genetic variation between species and varieties of trees (Perry, 1971). Different varieties of peaches require different amounts of CU. Therefore, certain peach varieties can grow at a latitude like Georgia (32.12° N) and others grow in an orchard in Hood River, Oregon (45.70° N). In Hood River, peach trees lose all their leaves, and their energy is stored in roots and trunk tissues from November until March. This is their time to chill.

I've sent photos of the winter orchard like the one above to my family in Mexico and Southern California. Many times, they have responded in disbelief, asking if my trees are still alive despite their appearance. My mom has asked several times in Spanish "So there aren't any leaves on the trees?", I'll say "No", still she asks "Not even a single leaf?" as if a single leaf is all you need to hold onto life. That's my mom in a nutshell, very little chill factor or CU for her to function and press on in life. Like peach varieties, it seems we all have different chilling thresholds.

Rest as Revolution

Reflecting on my tree's and mother's CU reminds me of my own chilling units. Summer harvest in the orchard can seem as though I'm pressing on like a peach tree with

a single leaf on the brink of going into dormancy. The Winter season reminds me how essential rest time is for renewal, restoration, and even revolutions.

I introduce the topic of rest as revolution in an analysis of interviews of three contemporary activists by braiding threads between their work. Rest as revolution is a concept enacted by Rachel Cargle's decolonial feminist perspectives and put into practice by performance artist Tricia Hersey. I apply the ideas of rest as resistance to the agricultural frame by reflecting on the mission of farmer and educator Leah Penniman. I center the deliberate voices of these three Black women and credit them in revealing a perspective in which agriculture can provide the opportunity to heal by creating safe and supportive spaces for BIPOC.

Rachel Cargle is a Black American public academic and activist who makes the elegant argument: "The liberation of Black women depends on their ability to rest" (Fleming, 2019). She sets the stage by describing the history of the racist foundations of the United States. Cargle reminds us that it was not slaves who were brought to the US from Africa-- it was doctors, storytellers, scientists, mothers, and many more who were brutally stolen, transported, and abused (TEDx Talks, 2019). She fearlessly comes face to face and depicts stories of enslaved Black women and describes how the logic that made those systems of abuse possible were based on valuing Black women solely on their labor and reproduction. As an antithesis to this, Rachel Cargle presents a critical standpoint of rest that makes a shift in the narrative from surviving to thriving. She defines revolution as the overthrow of social order in favor of a new system (Rachel Elizabeth Cargle, 2020). In an interview with Harper's Bazaar, she defers to Tricia Hersey's "Nap

Ministry" movement which pushes people to critically think about the ideas of rest, capitalism, and class (Fleming, 2019).

Tricia Hersey is a teaching artist and community organizer, among many other roles focused on education and creative empowerment. Her work examines liberation through naps. Tricia Hersey is the founder of The Nap Ministry, an organization and movement promoting the power of rest as a way of coping with trauma. To counter the suffering and loss that Black people have experienced in this country over the past 400 years, she creates spaces for Black people to practice rest, saying: "Rest is a great thing, rest is resistance, rest is reparations" (Garcia, 2020).

In her website, Tricia provides a visceral and deep image that presents a new narrative on how Black women are depicted in agricultural fields. The image is of a woman resting peacefully in a comfortable platform over a field of cotton. Tricia Hersey reinforces a new narrative in our consciousness by creating images of Black women resting that can exist within the landscape of imagery that often depicts Black people experiencing violence within agricultural settings.

Rachel Cargle and Tricia Hersey both create spaces for Black women to rest and heal. Their stories trace back to the violence and trauma experienced by their ancestors in this country, often in agricultural fields. They strive to shift this narrative through a revolution for Black women to rest. I connect their narratives of healing historical trauma to the work of Leah Penniman who embodies a narrative of a healthy relationship to agriculture as a Black woman.

Leah Penniman's book Farming While Black describes her passion to farm as an exercise in reclaiming her dignity through restructuring the relationship between Black people and agriculture. As a Black Kreyol farmer, mother, and food justice activist her work centers on training the next generation of activist farmers. Like Rachel Cargle and Tricia Hersey, she cites history to describe how Black, Indigenous, and People of Color in the US have systematically been removed from their traditional lands and coerced into traumatic labor conditions. Leah reminds us that oftentimes the scene of this violence was and is set in agricultural fields. It's no wonder why there exists a resistance towards engaging in agriculture in these communities. Leah Penniman started Soul Fire Farm with the mission to uproot racism in the food system and by reclaiming the right of Black and Brown people to belong to the earth and have agency in the food system. In an interview with Today about racism in the food system she reiterates:

> *"And so, when I say that farming while Black is an act of defiance against white supremacy, it's really reclaiming our right to belong to the land in the face of all of these attempts to drive us off the land"* (Boscamp, 2021).

Rachel Cargle, Tricia Hersey, and Leah Penniman conceive nourishing spaces where Black women can rest, heal, and access ancestral knowledge. The narratives they uphold have deep implications about how to uproot injustices that exact violence onto BIPOC communities. They are actively (and restfully) transforming systems of oppression through the power of the stories they share and the spaces they create.

As with fruit trees that do not receive the necessary chilling units to flower and produce a healthy next generation, historical trauma has deep intergenerational impacts on health (Mohatt et al., 2014; Sotero, 2006). These studies reveal that historical trauma

can lead to health disparities within entire communities of people descending from histories of trauma. Mohatt and colleagues discuss how conceptual reviews of history impact present-day health, highlighting that narratives and images can provide powerful reminders of atrocities of the past. Figure 10. Shows their conceptual on how historical trauma narratives connect to health impacts.

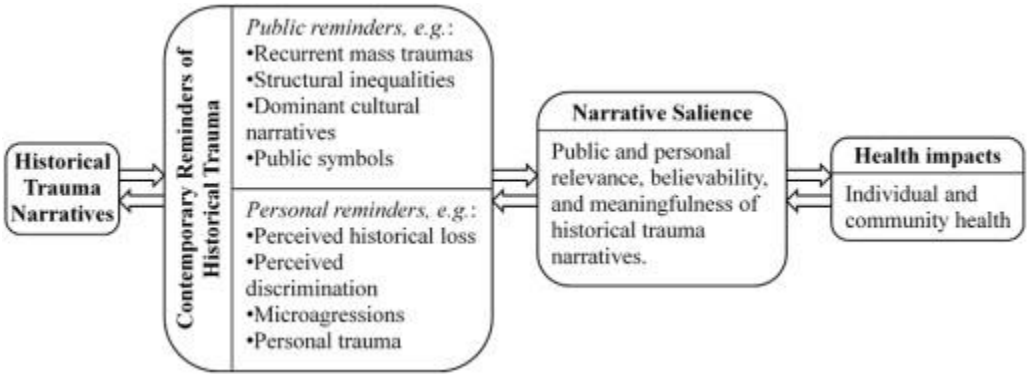


Figure 10. A narrative model of how historical trauma is connected to health impacts (Mohatt et al., 2014).

In this chapter, I reflect on the importance of shifting narratives by presenting the methods of Black women who are creating spaces to heal historical trauma and the associated health impacts. The three women presented in this section conceive of new landscapes through shifting narratives, the spaces they create, and even with new the imagery. Specifically, images and spaces like those described above restructure narratives and relationships between bodies of color and agriculture. To me, that image is a restructuring of narrative that reveals how rest in an agricultural field can be associated with thriving. Rest as revolution.

Pruning

There's no specific formula or algorithm to my approach on pruning peach trees, though I've made a short, written guide in Appendix B that I use when I introduce others to this language. It's all about cultivating a relationship and developing a vocabulary to communicate with the trees. I prepare my tools by cleaning and sharpening them with a stone each Winter. I walk through the orchard, observing and listening to how the trees fared through the winter. Each year I have this conversation with my trees and build a stronger relationship. I know how the different varieties; the different individuals can respond to my cuts. I envision the size and load of fruits their next generation will bring. Pruning trees has connected me to them deeply and ceremonially.

Peaches fruit on one-year wood, so only new growth from that year will bear fruit. Since they only fruit on one-year wood, they require annual pruning to renew the fruiting wood (Barney, 2013). Other fruits like apples and pears will grow on one- to three-year-old wood, so less meticulous annual pruning is required compared to peaches. The trees tell me it's time to prune as soon as the buds change shape; this communicates to me that the trees are coming out of dormancy and starting to cycle nutrients back into the canopy. In this section, I revisit the concept of reciprocity introduced in Chapter Two. In that chapter, I analyze the phrase "Eat peaches 'til you become a peach" in the section about the People of the Corn. That section builds on the point that domestication is a reciprocal process. This time I build on the concept of reciprocity through analyzing the vocabulary I've developed after years of pruning peach trees-- one that allows for peach tree and human being to communicate directly.

Figure 11. My peach trees in the winter, before pruning (above) and after (below) (Image courtesy of the author).

Pruning trees develops a deep relationship between human and tree, one that goes back in time to ancient lineages of wild peaches and people who helped develop them into the cultivars we now know. A population genomics study on the domestication of

peaches done by Cao et al. explores the influence of humans on the evolution of peaches (Cao et al., 2014). Cao et al. trace back current peaches to five wild varieties, which largely have fruit of very poor eating quality. Fast forward several thousands of years later and we have over 1,000 varieties of delicious eating peaches today. Cao and colleagues determine that there are two distinct kinds of artificial selection which have resulted in a group of peaches that were selected for ornamental qualities and another group selected for edibility. This selection was likely happening around 3,000BC by the people who lived near areas in China where wild peaches occurred. I doubt that the people involved in domesticating those groups of peaches were describing their selection process the way this Cao et al. study does:

> *"The ppa021198m and ppa001723m genes encode a transcription factor whose function is to be a positive regulator of flower development and signal transduction, and in particular to regulate the vegetative to reproductive phase transition of the meristem"*

It's humorous imagining people eating peaches thousands of years ago using this language. Yet, the stewardship of peaches for thousands of years based on scientific methods indigenous to the people of those lands has led to something so complex that can now be described in that vocabulary. I interpret the task of pruning as another vocabulary that has been developed over thousands of years of domestication. A vocabulary that allows us to let the trees know when and how many peaches to bear. I also reflect on the idea of mutual domestication through concepts of reciprocal relationship described by Rowen White.

Rowen White, a seedkeeper and educator from the Mowhawk Nation builds on the concept of reciprocal relationship as it connects to agriculture. She reminds us that "A long time ago, our ancestors—mine, yours, everyone else's—made agreements with plants that they would take care of each other" (Rokicka, 2021). Agriculture is at its essence an agreement between plants and humans. It is a story beginning with wild plants and humans who at some point came into a relationship and started to domesticate each other. As with corn, which depends on humans for cultivation and survival, people have formed special reciprocal compacts in which we depend on each other (Cajete, 2000). Wild peaches, native to China, fell into the caring hands of people in that region who stood under the caring canopy of the trees. Their selection changed those original five wild inedible peaches into thousands of cultivars shared around the world. It also changed people as far as the time, resources, and attentions dedicated to reproducing and caring for those trees. Peaches were transformed by human attention, but humans were also transformed by peach attention.

From an evolutionary science perspective, the same point of reciprocity is hinted at in observations of conserved gene sequences between species. There are even groups of hormones that are conserved and shared between plants and animals (Kushiro et al., 2003). This is surprising because the plant and animal kingdoms diverged even before they were multicellular, yet the chemical structures of some hormones are conserved. Each pruning cut sends a cascade of hormones that either shut off or turn on other genes that regulate tree growth (Janick, 2011). When I prune, I think about the languages developed over millennia that make that relationship possible; one of those languages is built on hormones, the other on pruning knowledge passed down. The different types of

cuts lead to different responses from the tree. Whether that response is understood by the person pruning as a "hormonal cascade" or a "tradition" is of little consequence in this case. As I cut branches, a cascade of hormones informs the tree's health and determines where its energy will be focused. More importantly, I can predict the tree's general reaction to my cuts. The more I prune, the more fruits the tree will set that summer. If I prune too much, however, a tree could bypass fruit production completely for that year. I consider how I impact the hormonal pathways of trees each Winter as I prune. I give the tree a complex message and though it takes months, the tree responds to me. This is a shared language between tree and human.

These two perspectives of pruning represent different ways of knowing or epistemologies (as discussed in the summer chapter). One is based on zooming in so closely to the tree that we can visualize the hormones cascading and responding to the different types of cuts on the tree. The other presents a story that zooms so far out that we can visualize ancestral knowledge passed down generation after generation. Both stories help me conceive of the reciprocity that exists between tree and human.

Seeds of Resilience

"If we don't tell our stories, we risk being pushed further into the shadows of the national dialogue on whole foods and sustainable living, a dialogue promoting the diets and practices our ancestors had well before the term 'organic' came into vogue" (Bowens, 2015).

As seeds lay dormant under the snow and cold of Winter, the instructions for them to grow are held within; instructions to transform into a myriad of plants that can bear fruits, trees, and build landscapes. While the history of agriculture is one that repeats violence towards BIPOC communities, some stories hold within them the instructions for us to grow and transform our landscapes. Just as important as it is to share some of the history of racism and inequality within agriculture, it is important to share the stories of hope, and the work that is being done to change those narratives. The intention of presenting the racist history of agriculture earlier on in this thesis is to allow the reader to reflect on the deep impact that history continues to have. I allow time for you, the reader, to process and consider the weight of that history before presenting the seeds of resilience in this section.

I share stories of resilience and hope from three women: Viviane Barnett, Dolores Huerta, and Tonantzin Tlalli. These stories help reclaim an identity rooted in healthy relationships to food and the land based on culture. Stories from cultures that have been historically oppressed and systematically excluded within these systems.

Viviane Barnett: Green Fingers Project

Viviane Barnett was a civic leader who developed community garden projects in a neighborhood in Portland, Oregon. The neighborhood had had hundreds of African-American residents displaced through eminent domain in 1968. She created the Green Fingers Projects which included 300 people who volunteered their labor, donated seeds, tools, and plant starts. This project held festivals that celebrated food, had music and gave prizes for the best gardens. She garnered attention from First Lady Pat Nixon and Senator

Robert F. Kennedy and was able to attain land use permits to continue growing food for her community in the very neighborhood that African-American residents had been displaced from in order to build a freeway. However, by 1970 construction in that area continued and uprooted the original Green Fingers Project. By that time, several offshoot projects were started around Portland, and seed was distributed from the original Green Fingers Project. In 1972, as the relocated garden projects were getting ready to harvest food crops, the gardens were bulldozed by the Portland Development Commission (PDC) destroying their crops. Even still, Green Fingers Project inspired the emergence of community gardens throughout Portland, that now serve over 1,500 participants. Viviane Barnett humbly stated in an interview with Pat Nixon, that this project was not hers, even though it was her idea. This idea came out of a desire to address hunger in Portland through civic engagement and community organizing to grow food in their neighborhoods. It was an idea that sprouted community gardens throughout Portland.

Regardless of the literal bulldozing of her projects and community garden, Viviane Barnett continued the momentum to build community gardens growing food in Portland, Oregon. She passed away in 1983, leaving a legacy that spurred the spread of community garden spaces to make food available. Though her story is not widely spread, I have the honor of hearing her story and words as a recipient of the Viviane Barnett For Food Systems Leaders Fellowship 2021-2022. Now I share that story with you. Her story inspires this network fellowship of 16 BIPOC food systems leaders in an effort to explore new possibilities and create opportunities for racially equitable and climate resilient food and farming systems.

Dolores Huerta: Si Se Puede

Dolores Huerta is a well-known labor leader and co-founder of the National Farmworkers association which merged to become the United Farmworkers Association. She supported and led in Mexican American civil rights struggles during the Chicano movements of the 1960s and 1970s (García, 2008). She was an early environmentalist, involved in protecting farmworkers against the health effects of pesticides used in the fields which were leading to many illnesses, physical problems, and increased incidence of cancer. Dolores Huerta stood up against the immense power of agribusiness, local politicians, and police officers in order to organize a farmworkers union. This was something never done before, and so daunting that Garcia makes a parallel to the David and Goliath story in the book: *A Dolores Huerta Reader* (2008).

Dolores Huerta left her teaching career to organize farmworkers to fight for better working conditions and better pay (Mineo, 2021). Since then, she has fought ceaselessly to improve the conditions of farmworkers. When she started her work, farmworkers did not have access to basic needs at work such as toilets, washing stations, and lacked labor protections. The impact of her work has made significant improvements in the living conditions and labor rights of farmworkers, though there is much work to be done in these areas. Her passion has such force, never losing sight of her sense of responsibility to her community, that she continues to engage with it to this day. At 91 years old, she continues to inspire the next generation of activists through the Dolores Huerta Foundation and still participates in public conversations on these topics.

Tonantzin Tlalli: Madrecita Tierra

Tonantzin Tlalli is roughly translated as Mother Earth, with the diminutive form of "mother" indicating reverence as "our dearest mother". I include Tonanzin Tlalli here because she is a component of the cosmology that shapes my cultural understanding and relating to Mother Earth. The analysis of cosmovision is imperative, as farmers' perceptions of the world helps organize their behaviors and decisions which are based on their cosmovisions (Parks & Brekken, 2019). Cosmovision has been used to explore indigenous beliefs from a decolonized perspective and is increasingly being used to apply to other fields of study like that of Parks and Brekken, which analyzes what informs farmers to practice organically versus using chemical inputs. The perception of Earth is the literal and figurative foundation for how different people organize their lives. I focus here on relating a story of Tonantzin Tlalli that reaches back to the roots of Mexican Indigenous traditions based on Nahua peoples. It is a cosmovision that informs the structure of this work by reinforcing how nature informs thought—forming bridges between metaphors and knowledge. A dialogue of past and present to build on our understanding.

The description of Tonantzin Tlalli here is based on the academic work of Elizabeht Gatica Poloco (Gatica Polco, 2018). She interviews elders in an Indigenous pueblo in Chiepetepec Guerrero, Mexico to investigate the inheritance of Tonantzin Tlalli in this region. She reminds us that oral histories, stories, and myths are not linear, just as cultures are not linear, homogeneous nor unidimensional. The focus of her analysis is

centered around distinguishing concepts of "soil", "territory", and "Mother Earth" in this region.

Elders describe Tonantzin Tlalli as the ultimate mother figure, a living being in which the people are one of the elements within the vastness of her capacity to create and transform. She is held as sacred, requiring particular attention from the people regarding reciprocity and equilibrium. Some of this attention is in the form of rituals and offerings made to the deities connected to her, but it is also enacted through their sense of stewardship. Through lived experience itself, Tonantzin Tlalli transmits knowledge on the origins and order of the world. By pronouncing Mother Earth, Madre Tierra, or Tonantzin Tlalli, it is all included: the rituals, the traditions, the knowledge, and the memory. Elders remind Gatica Poloco that Tonantzin Tlalli is an ancient system of life connected to philosophy and passed down. An Indigenous philosophy that guides people on how to be connected to our Dearest Mother Earth.

Conclusion

The Winter days are short, signaling a time for rest. I explore the practice of rest as revolution through the narratives of contemporary Black women activists in connection to healing historical trauma and accessing ancestral knowledge. As a result, this chapter is a contrast to the summer chapter both in seasonal activities but also in the approach to discussing historical trauma. In this chapter, I present shifting narratives within the racialized history of agriculture that move towards imagery and stories that offer seeds of resilience.

As I prune the trees in late Winter when the snow starts to melt, I step back to internalize how each cut affects the tree as a whole; zooming into minute details then zooming back out to check the canopy as a whole. This process informs the analysis approach in this chapter. At times I zoom in to consider details like conserved hormones and genes, then zoom back out to consider time-honored traditions passed down over millennia. These traditions include narratives that shape my understanding of our relationship to our Dearest Mother Earth, Tonanztin Tlalli. Narratives that shift the focus on the racialized history of agriculture to imagining systems based on equity, justice, and rest.

Chapter 5: Spring- Blossoms

When the snow melts and the Spring sun shines on my face, I get a glimpse into what the trees must feel to reawaken from the cold Winter rest. The branches start to grow and their color changes from dark brown to a maroon, reddish color. I watch as the tiny scales on the branches start to puff up and angle out until I can see a little pod of petals about to burst. One day, the pink peach blossoms decide it's time to open and the scent of light floral almonds hangs in the air, luring bees from all around to visit. Each delicate petal unfurls at its own pace until the fully opened flowers paint the orchard pink, luring people who drive or walk by to visit. I pluck an open blossom, opening it up until I can see the droplet of nectar at the base of its center. I'm wondering what keeps the bees so driven, curious about this nectar of life guarded by each blossom. I'm not disappointed by the sweetness that flavors a tiny part of my tongue and am in awe that I can already feel the tiny fuzz of the future peach too.

Figure 12. Honeybee approaching an open peach blossom (Photo courtesy of the author).

Spring Cycle

Considering the new possibilities from renewed growth in the orchard, this chapter examines approaches for managing the orchard floor organically. For a vegetable farmer, Spring is an opportunity to start all over, planting new seeds in the blank canvas that is the soil. It's different for an orchardist tending to trees that remain over the winter and reemerge in the same location every year. However, there are opportunities to interact with the soil each Spring to help trees get the nutrients they require. This chapter examines mulching as a management strategy for an organic orchard through a literature

review and a quantitative study I designed and conducted comparing mulch options. The central question addressed is:

How do I organically manage an orchard floor?

Over the course of a year in the orchard, I applied three different compost mulch treatments and compared their effects on a standard soil nutrient panel. In this chapter, I compare the nutrient levels of the three treatments and analyze what those changes tell us about those mulch options.

Peach Blossoms

When a bee visits a peach flower like the one in Figure 12, pollen from other varieties of peaches in the orchard can travel with it. We learn early on that bees are essential to the food web because they pollinate many of the foods we eat. Peaches are self-fertile (only one tree is needed to flower and produce fruit) but require insects to pollinate even their own flowers. What is interesting about peach pollination is that the peach crop can improve if flowers receive pollen from other varieties of peaches (Layne & Bassi, 2008).

In our orchard, we have 25 varieties of peaches planted, so the variety of pollen available helps to improve our crop, even though a single variety would suffice to achieve pollination. More in-depth studies done in Chinese orchards have found evidence that there are even differences in peach size and time of ripening depending on the type of bee that pollinates the flowers (Dong et al., 2011). A study in China comparing pollination between native bumblebees and western honeybees demonstrated that honeybees were depositing more pollen on the flowers they visited, compared to

honeybees (Zhang et al., 2015). Bumblebees preferentially collected pollen, while honeybees preferred to collect nectar. Zhang and colleagues found that the time between pollination and fertilization was shorter for bumblebees, compared to honeybees due to the difference in the interactions between pollen and pistil between the two species. The difference in timing allows for the fruit to get a head start in growing in the seasons and can account for earlier ripening and fruit size differences.

Figure 13. Tiny green peaches emerge from the pollinated flowers. Pistil and stamens are still attached. A moment in the transformation from flower to peach (Photo courtesy of the author).

The finding that even the type of bee that visits a flower can have an impact in the whole life cycle and development of a peach is astounding. Similar to the butterfly effect

in chaos theory that describes how one small change in a nonlinear system can result in larger differences in a later state. The ripple effect of a tiny bee and the even tinier pollen and unique behaviors can affect a whole crop of peaches.

The focus of this chapter is on nutrient analysis of compost mulch treatments and it was the impetus that pollinated the rest of the ideas I present in the previous chapters. Carrying out this experiment rippled into questions that asked me to consider my positionality, including my responsibility as a researcher and different ways of knowing that form a crucial part to why I choose to investigate this question in the potential ripple effects.

Orchard Floor Mulch

The orchard floor is the foundation of the health of trees, influencing nutrient availability, water intake, stability, and potential pests. Prior to being an orchardist, the image that came to mind when thinking of an orchard was of a vast dirt floor with rows of trees stretching as far as the eye could see. This image came from seeing the almond orchards of the California Central Valley. When I had the opportunity to travel and see other orchards that image shifted. Still, it was an image that still contained strips of bare soil but with strips of grass growing in the drive alleys between tree rows as in Figure 14. At that time, I assumed the empty areas between the grass alleys to be a result of the shade the trees cast onto the floor.

Now that I've been managing an organic orchard for over six years, I realize how naive my view was. The barren soils under the trees as seen in Figure 14 are the result of herbicide sprays that kill the plants in the tree rows, leaving behind bare soil. I contrast

that next to our organic orchard, where the grass and other plants grow directly up to the tree and fill the entire orchard space.

Figure 14. A conventional orchard on the left and my organic peach orchard on the right (Image courtesy of the author)

In the Pacific Northwest, most conventional (non-organic) stone fruit orchards are managed using herbicides to control weeds within the tree row, with a perennial drive alley for a stable driving surface for machinery (Granatstein, Wiman, Kirby, & Mullinix, 2010; Yin et al., 2007). This standard approach of applying herbicide is associated with contamination of nearby water sources (Yin et al., 2007).

Tillage is often a replacement strategy for organic orchard management; however, tillage increases erosion, compaction, and decreases soil fertility (Tebeau et al., 2017). It's been long known that excessive tillage decreases organic matter in soils, making it less permeable to water, air, and roots (Green, 1981). While tillage is technically an organic option, it can lead to the degradation of soils, which is not in compliance with USDA's requirements that organic orchards maintain or improve soils. Other organic options for orchard floor management also have sustainability trade-offs associated with them (Granatstein et al., 2010). Committing to an approach for orchard floor management

(OFM) will depend on unique characteristics based on location, finances, resource availability, and many other factors considered by the individual orchard managers.

Literature on orchard floor management (OFM) reveals that often, there are tradeoffs associated with different organic approaches. The orchard floor is a complex system that requires nutrient management, pest management, and weed management. Changes in these can affect the physical support of tree growth, water intake, gas exchange, habitat, and microclimate (Granatstein & Sanchez, 2009; Yin et al., 2007). Often, the primary objective of orchard floor management is to maximize tree growth and productivity by promoting tree health. Providing the necessary nutrients for an organic orchard can be more complicated than with non-organic orchards because organic materials used for nutrient management have slower and less predictable mineralization than their synthetic counterparts. Slower mineralization means a slower availability of nutrients for the trees. The timing of nutrient supply is crucial for fruit trees as certain minerals like nitrogen available at the wrong time can have negative impacts on fruit maturity.

General Overview of OFM

In the Fall Interview chapter, I discuss how several orchardists were familiar with primary literature on orchard management, mostly via Youtube.com. One of the names mentioned was that of David Granatstein from Washington State University (WSU CAHNRS, 2015). As a sustainable agriculture specialist, he conducted a comprehensive review of current research knowledge and needs for orchard floor management (OFM) in organic fruit tree systems with colleague Enrique Sanchez (2009). This comprehensive review claims that all organic options for OFM have sustainability tradeoffs. Those

tradeoffs are listed in Figure 15 and should be evaluated according to factors that are regionally specific, including the age of the orchard, climate, and topography.

	Pro	Con
Tillage	Effective	Reduced tree growth, fruit size
	Reduces rodent habitat	Costly in young orchards
	Relatively low cost	Can damage roots and trunks, irrigation system
		Can degrade soil quality, deplete organic matter
Flaming	Can control weeds around trunk	Potential tree injury
	Reduces rodent habitat	Not good for older weeds, perennials
	Relatively low cost	Uses fossil fuels
		Irrigation system damage
Inert mulches	Effective for most weeds	Costly to apply
	Can improve soil quality	Can tie up N
	Conserve moisture	May be hard to source
	Improved tree growth, yield	
Living mulches	Add biodiversity	Compete with trees
	Benefit soil quality	Rodent habitat
	Legumes can fix N	Variable persistence
	Theoretically low maintenance	Variable ability to compete with weeds
Organic herbicides	Can control weeds around trunk	Expensive
	No physical damage to tree, roots	Inconsistent effectiveness
	Reduce rodent habitat	May need many applications
		Few registered products

Figure 15. Pros and Cons of orchard floor management systems summarized by David Granastein. Source: (Granatstein & Sanchez, 2009)

Granatstein and Sanchez (2009) conducted a cost analysis and concluded that often, options available to organic orchardists are not as cost-effective or as durable when compared to the conventional herbicide methods. However, this part of the analysis did not take into account negative externalities associated with herbicide application which include: fossil fuel use in the production of materials, pollution of aquifers from production and application, or health effects to people and ecosystems. Herbicides kill living plants on the soil, leaving soil exposed and susceptible to erosion and the formation of dust that can transport the harmful chemicals. Many studies reveal that pesticides can be found in the dust of homes of people who work in agriculture or live

near agricultural areas (Harnly et al., 2009; Quirós-Alcalá et al., 2011; Simcox et al., 1995).

Other negative externalities include fossil fuel use in the production of materials, pollution of aquifers from production and application, health effects to people and ecosystems. Herbicides kill living plants on the soil, leaving soil exposed and susceptible to erosion and the formation of dust that can transport harmful chemicals.

Peach-Specific OFM

While my interest is in reviewing OFM for peaches because I am a peach orchardist, I found that there were few studies done on peach orchards comparing organic mulch treatments. Initially, I found a study as early as the 1950's that explored organic mulch options in a peach orchard in the Yakima Valley. In this study, they used straw mulch to cover the orchard floor and found that it did not limit nutrient availability, with the exception of nitrogen (Proebsting, 1958, cited in Granatstein and Sanchez, 2009). That study showed promise for using mulches as an organic alternative for managing an orchard floor.

I didn't consider using straw mulch in the orchard at the time because I had heard from a few local farmers (farmer knowledge) that they had terrible problems from bindweed seed getting into their plots from using straw mulch. One neighbor shared that the bindweed destroyed her raspberry patch and brought in powdery mildew early in the season. There were still many other options to consider including: tillage, inert mulches, living mulches, flaming, organic herbicides. All of these options with the trade-offs listed in Figure 15. I decided to conduct my OFM experiment by applying compost (inert

mulch) because I came across two thorough studies of compost mulch application in peach orchards. These studies demonstrated that compost can be used to provide necessary nutrients and fertility for peach trees, which I discuss in detail below.

An initial study by Baldi et al. found that compost application improved plant growth and nutrient concentration in peach tree tissues (Baldi et al., 2010). While this study was carried out in potted peach trees, it was an initial evaluation of compost which demonstrated that compost could provide the necessary nutrients by affecting soil chemistry. This step confirmed that compost not only improves the biological characteristics of the soil but that it also improved chemical characteristics which can help trace nutrient availability. The second study was a nine-year compost application experiment conducted in a commercial peach orchard (Baldi et al., 2010). In this study, they compared six different orchard floor treatments including (1) unfertilized control, (2) mineral fertilization, (3) cow manure, (4) compost, (5) higher rate of compost, (6) compost spread out over time. Their main findings are accurately reflected in their title "Compost can successfully replace mineral fertilizers in the nutrient management of a commercial peach orchard".

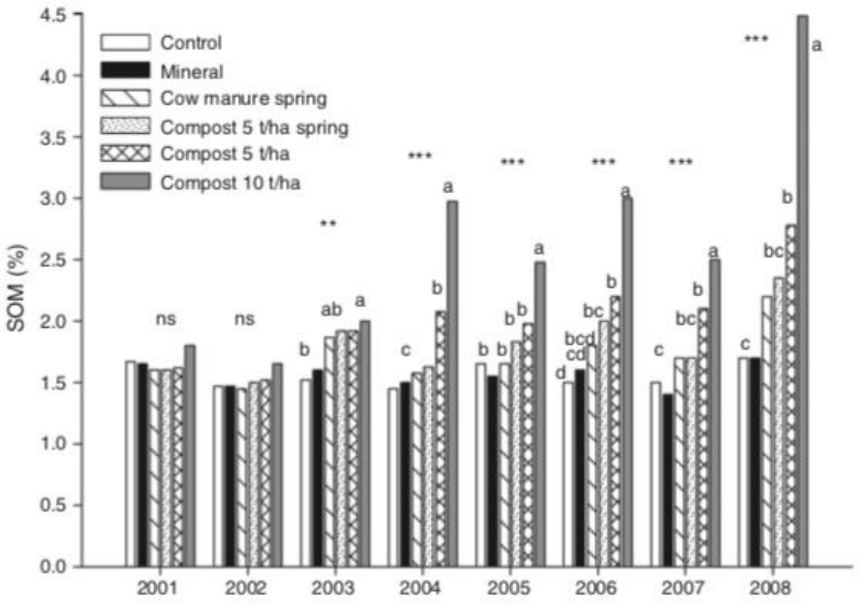


Figure 16. Changes in soil organic matter (SOM) for each treatment from 2001- 2008. Samples collected at 0-40cm depth. Means followed by the same letter are not statistically significant. ns, **, *** = effect not significant or significant at P≤ 0.01 and P≤ 0.001 respectively. Source: (Baldi et al., 2010, p. 349).

The orchard floor management study by Baldi et al. consistently found higher soil organic matter (SOM) for the compost applications when compared to the other treatments. As shown in Figure 16 significant differences were observed from the third year onward, with the highest application of compost showing the largest significant increase in SOM when compared to the control. SOM was also higher in all the compost applications when compared to mineral and control treatments after the third year and for every year after that.

A potential concern in their findings was that compost treatment had a significant increase in copper and zinc levels present in the soil. However, Baldi and colleagues explain that these levels remain well under those recommended by legislation. Still, they recommend monitoring levels of heavy metals under high compost applications. In

addition, measurements on fruit yield between years 2008 and 2009, showed that the only statistical difference between fruit production was between the treatment where they spread compost several times over the season, compared to the unfertilized control. This means that only the highest application rate of compost resulted in increased fruit production when compared to the control.

In addition to evidence from these studies, certified organic compost is commercially available in the Hood River Valley, whereas other organic inert mulches are more challenging to source locally. My organic certifier requires I provide proof that all my inputs are organic, with thorough documentation of any input I include in my management practices. Since I had a course of certified organic compost available locally, this made it a viable mulch option to test.

Regional Specificity

Prior long-term studies in Italy have confirmed that compost applications can replace mineral fertilizers in commercial peach operations. However, this study is highly specific to the region in Italy and to the quality of compost that was used since compost can vary greatly depending on the source. No single approach is likely to be best across different orchard conditions based on region, microclimates, and availability of resources. However, previous studies show that compost application can be sufficient to manage the long-term fertility of peach and other fruit orchards. One study carried out in an organic apple orchard showed that there was a significant difference in organic matter after one year of compost application (Zoppolo et al., 2011). The orchard mulch study I conduct on my commercial peach orchard is regionally specific to the Hood River Valley, taking into

account soil conditions, commercial availability of compost, as well as local and farmer knowledge.

Experimental Design

In this chapter, I present an analysis of soil nutrient composition comparing the effects of three organic mulch treatments I applied in my commercial peach orchard located in the Hood River Valley. Three different treatments were applied in a randomized design, allowing one year to elapse between soil sample collections to compare conditions before and after treatment. The soil test panel includes measures for organic matter, pH, Buffer Index, phosphorus, potassium, magnesium, calcium, sodium, sulfur, and Cation Exchange Capacity. I compared differences between groups of treatments through an analysis of variance (ANOVA) in R. I conducted a posthoc analysis using Tukey's Honest Significance difference test to determine which groups had significant differences in means.

Description of the Orchard

The site of my experiment was my commercial peach orchard in the Oak Grove neighborhood in Hood River, Oregon. The orchard has been certified organic since 2018 and managed using organic practices three years prior to that. Prior to our management, the orchard was under other ownership and was managed and established using conventional chemical methods. There is a required wait period of three years between chemical management and organic management to be allowed to submit an application for organic certification.

The orchard soil is deep, well-drained loam formed in Lacustrine glacial outwash, with colluvial and alluvial deposits (USDA Soil Conservation, 2001). Effective rooting depth is more than 60 inches. All plots were irrigated equally with micro-jet sprinklers, received the same fertilization with feather meal, and received the same treatments for pest management. Pest management included antifungal organic sprays including neem oil, lime-sulfur, and copper as well as cultural practices like clearing out rotting fruit. The practice of continuing normal fertilization schedules on test sites follows procedures set forth in orchard mulch studies carried out by David Granantstein, the principal investigator in Organic Cropping Research for the Northwest grant (Granatstein & Mullinix, 2008).

Annual precipitation for my site ranges 34-45 inches and average air temperature 48-51°F (Green, 1981). Irrigation is provided from June to September from the Farmer's Irrigation District. Trees are of similar age and size; however, the exact age is unknown as they were established by the previous owner. I estimate their age to be between 12-18 years. Trees were planted at a distance of 13 feet apart and are pruned in an open-vase system (described in Appendix B).

Design

The experimental design was based on a randomized complete block (RBC) design which is typical for orchard horticultural research and one of the most common experimental designs in agronomy (Washington State University Tree Fruit Research and Extension Center, 2000; Dixon, 2016). I selected four of the most similar rows in the orchard with similar slope and number of trees as my four replicates. Treatments were randomly assigned for each row using a random number generator. Randomly assigning

treatments in otherwise similar units (blocks) leads to a more precise measure of differences between treatments (Dixon, 2016). The trial started in September 2018, samples were collected in October 2018 and again in October 2019. Each replicate consisted of 16 trees, which were divided into four contiguous plots, each receiving a different treatment as shown in Figure 17.

Figure 17. Google map image of my peach orchard with black lines indicating the 4 rows selected for the experiment and how they were subdivided into 4 plots each.

Each plot contained four trees, with two central trees and one guard tree on each side. While guard trees received the same treatment applied to the two central trees of focus, their purpose was to minimize potential runoff effects from adjacent treatments (Tebeau et al., 2017). This sampling method has been employed with similar studies and was also recommended by the local Horticulture OSU Extension Field Faculty Ashley Thompson, whom I consulted with in person for support on my experimental design (Tebeau et al., 2017; Thompson & Peck, 2017). Treatments were applied by me and my volunteers for the season. It was a time-intensive and labor-intensive process, which gave me insight as to why some orchardists have moved away from this practice. The following treatments were applied to all four trees in each corresponding plot: (1) Control (2) Compost (3) Double compost (4) Compost + Wood Chips, application rates in Table 2.

Table 2

Orchard Treatment Applications

Treatment	Application Rate
Compost	Compost: 54 cubic feet per 4 trees
Double Compost	Compost: 104 cubic feet per 4 trees
Compost + Wood Chips	Compost: 57 cubic feet per 4 trees Wood Chips: 66.5 cubic feet per 4 trees

Note. Application rate of the three mulch treatments applied to the orchard

Soil Sample Collection

Obvious mulching material was removed prior to sampling by scraping off the top layer of plant and mulch material, to obtain the actual soil below. I collected composite samples from each of the 16 treatment plots, each sample comprised of seven sub-samples that were combined and blended into one homogenized sample. Samples were collected at the end of October in 2019 and 2020 after several days of rain, which allowed the drive-type soil corer to penetrate the full depth of the 12-inch vertical soil sample core. Samples from before and after treatment were collected during the same time of the year to minimize variation due to temperature and rainfall. The same protocols employed in the first sample collection were followed for submission to the soil analysis laboratory.

Samples were taken from the central two trees in each treatment plot at a distance of two feet from the trunk of the central trees in each cardinal direction and one between trees as shown in Figure 18. The sampling was physically challenging likely due to soil compaction and to the presence of roots and rocks in the sampling areas. Towards the end of sample collection, the pedal which drives the soil corer broke off and had to be welded back on to continue sampling.

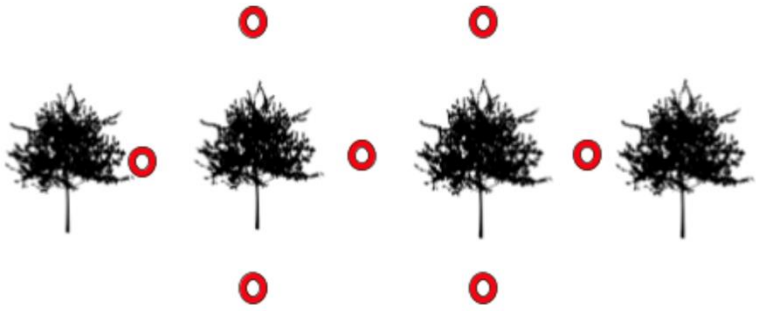


Figure 18. Schematic of distribution of soil sample cores for the peach plots consisting of four trees.

Composite samples were transferred to plastic bags and air-dried as per handling methods commonly employed (Conklin, 2014). I chose to air dry soil samples since they had been subject to wetting and drying cycles in the field (Carter & Gregorich, 2008). In addition, the soil analysis company requests samples are air-dried prior to submission. Samples were dried for 1 week after collection. I then submitted my samples to A & L Western Agricultural Laboratories, INC in Portland, Oregon for analysis.

Summary and Results

I compared three different mulch treatments in a peach orchard floor relative to the option of no mulching, which was used as a control. After a whole year of applying these three mulches and visualizing nutrient data for before and after, I generated boxplots of the data using the statistical computing program R. I first graphed cumulative averages of the data, comparing before and after treatments overall for each of the dependent variables. To determine if I could carry out an analysis of variance (ANOVA) for any of the dependent variables, I tested each of their distributions for normality. I

tested dependent variables for normality using a Shapiro-Wilkes test and by visualizing the data as a histogram and Quantile-Quantile plots.

Each of the 16 plots' soil samples were tested using a comprehensive soil testing option for nutrient analysis available at A & L Western Agricultural Laboratories, in Portland, Oregon. This test included measures for organic matter, pH, Buffer Index, phosphorus, potassium, magnesium, calcium, sodium, sulfur, and Cation Exchange Capacity. The only measures that exhibited statistically significant differences between means of treatments were those for potassium and sodium. However, because of the centrality of organic matter to compost, I begin with a discussion of why there were no observed statistical differences in organic matter between the different orchard floor treatments.

Organic Matter

Soil organic matter (SOM) contributes to fertility in several ways, including retaining plant-available nutrients, retaining water, and promoting soil structure formation (Lehmann & Kleber, 2015). A one percent increase in organic matter can lead to a 20,000-gallon increase in water holding capacity for soils (Bryant, 2015). Organic matter is a central focus because it affects all other soil properties. Organic matter also decreases erosion by acting as a binding substance at the surface of soils. Organic matter in soils is consumed by agricultural practices, so it is a key component in managing fertility for farmers and orchardists.

A few times, I have been asked by other farmers about my organic matter in casual conversation. Soil organic matter is made up of a mixture of recognizable plant

and animal materials as well as materials that have been altered to no longer retain their original form (Oades, 1988). It consists of three main components: living organisms, fresh residues, and well-decomposed residues (Magdoff & Van Es, 2009). The living component includes fungi, bacteria, amoeba, insects, and other detritivores. Fresh residues include plant material, deceased organisms, and manures. Well-decomposed materials are the result of the interaction of the first two components, leading to smaller and smaller units of residues and residues resulting from living components. Plants play a key role in soil formation in that they influence the type, amount, and depth distribution of how all of this organic matter is incorporated (Green, 1981).

Based on the mulch studies done by Baldi et al. in peach orchards in Italy, I anticipated having increased levels of organic matter after compost mulch application. When initially reviewing SOM, I compared cumulative measurements that included all treatments and control together to see if there were overall differences in organic matter before and after. The boxplots in Figure 19, indicate there was an overall increase in organic matter during that year. However, this does not tell us whether that increase was due to treatments applications or something else.

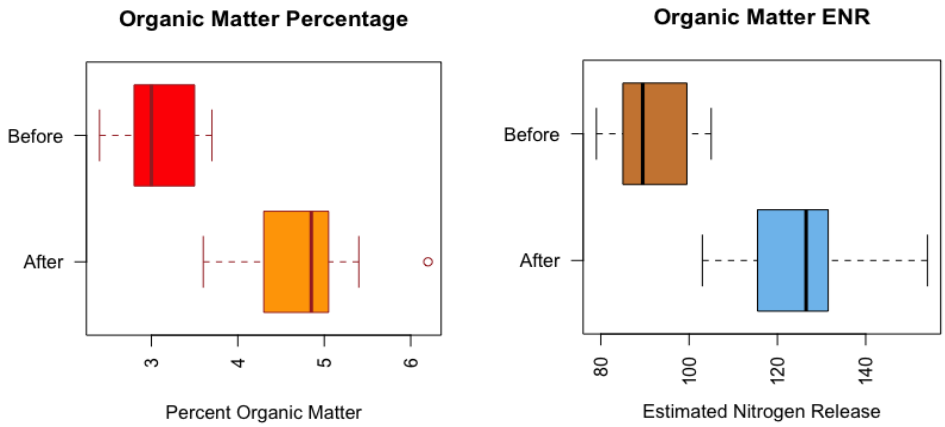


Figure 19. Box plots of organic matter before and after treatment with mulching, including control plots. On the left is Percentage of Organic Matter, on the right is Estimated Nitrogen Release.

To examine if the increase in organic matter might be related to a particular mulch treatment, I conducted an analysis of variance (ANOVA). The boxplots associated with the ANOVA appear in Figure 20 and correspond to the treatments: Com = Compost, Com_Mul= Compost + Mulch, Ctrl = Control, Dbl = Double Compost application. While there was a difference in organic matter with a median of three percent to nearly five percent after treatments, all the plots showed an increase in organic matter, including the control. There were no statistical differences in the organic matter levels between treatment groups, either before or after mulch application.

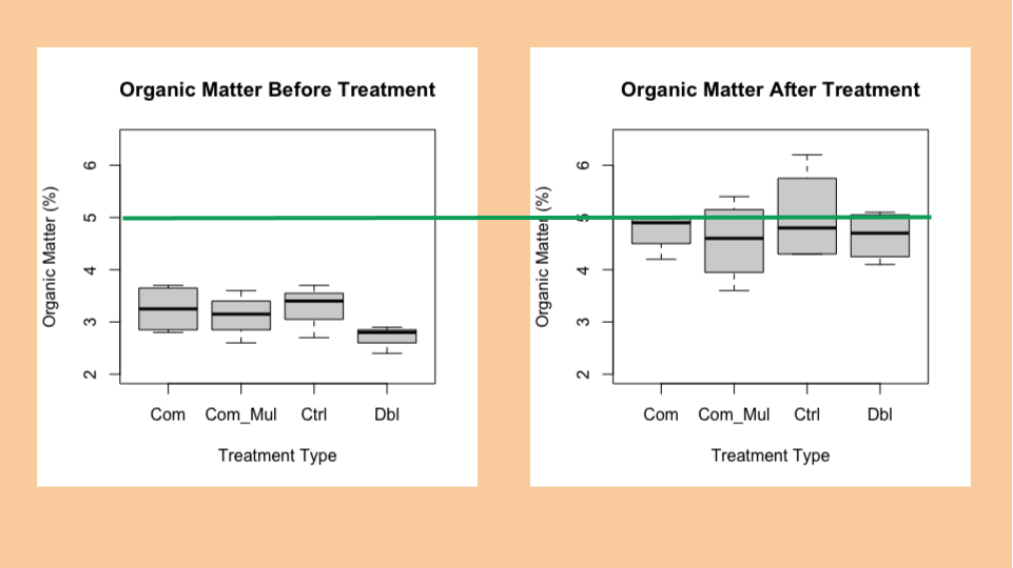


Figure 20. Boxplots generated from ANOVA test comparing organic matter percentage for each mulch treatment including control for before and after treatment application. The green line indicates estimated recommended organic matter levels for the Hood River region.

As mentioned, while there was an overall increase in organic matter between the two sample collections, the increase was not correlated to specific treatments. Possible sources for increasing overall organic matter could be the feather meal fertilizer that was applied equally to all plots, including the control. Another potential source is grass clippings that lay on the ground after mowing between the rows of the peach trees. The orchard floor has year-round ground cover composed of grasses and common weeds which we mow several times throughout the summer. The mowed material is left on-site, so there is some return of that organic matter into the soil. Leaving a ground cover in the orchard helps reduce erosion, and since the topsoil has the highest concentration of organic matter, a groundcover protects nutrients and organic matter from wearing away.

Finally, it is possible that one year was not a long enough trial period to observe differences in soil organic matter. While the study by Zoppolo et al. which did show

differences in SOM over the course of one year, the study done by Baldi et al. in the commercial peach orchard only showed statistical differences in SOM after the third year of compost application (Baldi at al., 2010). This is likely due to the slow mineralization rates of nutrients present in the compost, compared to chemical inputs. Any or all of these factors could have contributed to the lack of difference in SOM among treatments.

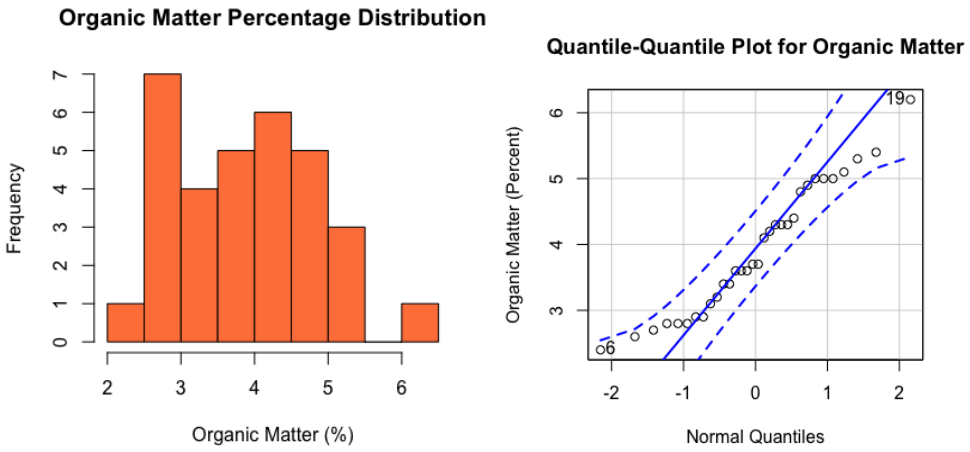


Figure 21. Tests for normality of the overall data including histogram data visualization and quantile-quantile plots.

Watch your Salts

Potassium

Measures of potassium revealed significant differences not only in the cumulative before and after treatment comparison but across the different mulch treatments. There was an overall increase of potassium for all treatments after the application of mulch. All groups except the control exceeded the recommended level by at least 200 ppm. The recommended levels of potassium are visualized in the boxplots in Figure 22 with a green horizontal box.

When comparing treatment groups, no statistical differences appeared in the data prior to the application of mulches. However, after treatment with mulch, not only were potassium levels higher overall but there were statistically significant differences between group means. A posthoc analysis using Tukey's HSD test revealed that significant differences to the control means for both the compost and double-compost treatments (with a 95% Confidence Interval and p values of 0.042 and 0.030 respectively).

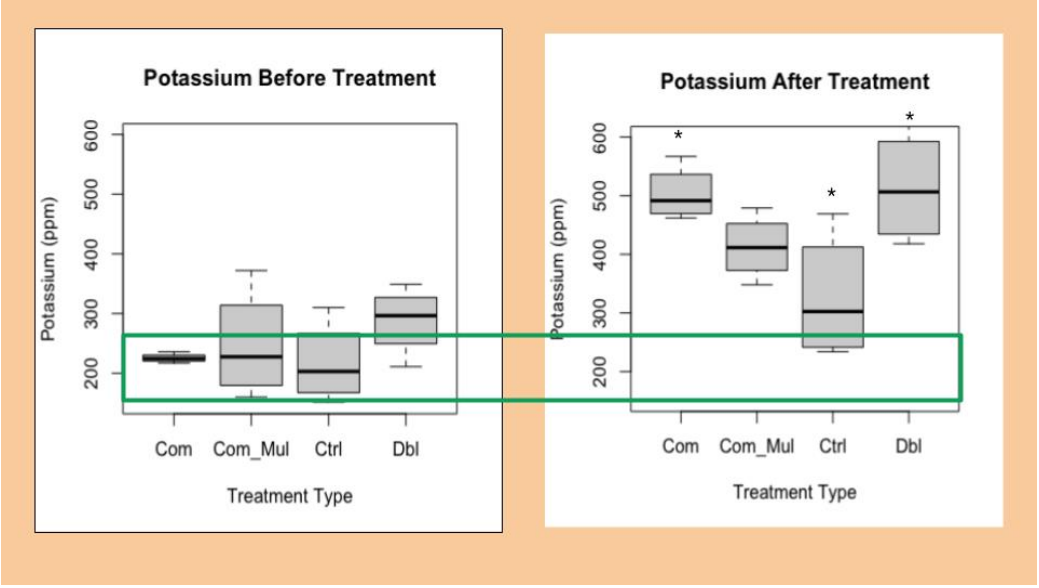


Figure 22. Potassium levels before and after mulch treatment for each of the treatment applications. Asterisks represent medians which are statistically different from each other within each of the graphs. Green box represents the recommended potassium range.

Potassium is a common amendment to agricultural soils that is essential for plant function and growth. Most basic commercial fertilizers will promise to increase nitrogen, phosphorus, and potassium, and often list the trio as a series of three numbers on the front label. Industrialized agricultural systems schedule regular intensive inputs of potassium

fertilizers through a view that it is indispensable for maximizing crop yields (Khan et al., 2014).

Although it is an essential component for plant health, having levels of potassium that are too high can also cause problems. Khan et al. examined how using too much potassium in amendments could potentially lead to less nutritious crops (Khan et al., 2014). Elevated potassium levels can interfere with bioavailability of calcium and magnesium (Baldi et al., 2010). These other nutrients are also essential for healthy plant growth. If they are less bioavailable, then the plant will have less access to them, and there is a potential for a crop with lower nutritional content to result. Diets low in calcium are linked to several well-known human diseases such as osteoporosis (Khan et al., 2014).

Unfortunately, regular soil tests that include potassium are not likely to be a reliable enough measure of available potassium to inform soil management (Khan et al., 2014). This is because not only are levels highly given to fluctuations based on seasonal changes but because some is stored in non-exchangeable and mineral forms. (Khan et al., 2014). Still, this comparison revealed that there were significant differences between the means of groups with different compost treatments.

Sodium

As with potassium, sodium levels also increased after mulch treatments with significant statistical differences between treatment applications. Before the application of any treatments, the mean value for sodium for all treatments including control were under the recommended levels by less than 10ppm, with some values well into the

recommended range. There were no statistical differences between groups before treatment applications.

After the application of mulch treatments, there were significant differences between the treatments as seen in Figure 23 for sodium. The application of double compost even had values that exceeded the recommended levels (by less than 10ppm), while the mean was well within recommended levels. In fact, all the other treatment means remained below the recommended sodium levels, one which was under by more than 20ppm. A posthoc analysis using Tukey's HSD revealed there was a significant difference in means between Control and Double Compost as well as between Double Compost and Compost plus mulch. There was no significant difference in sodium between Compost and Double Compost applications.

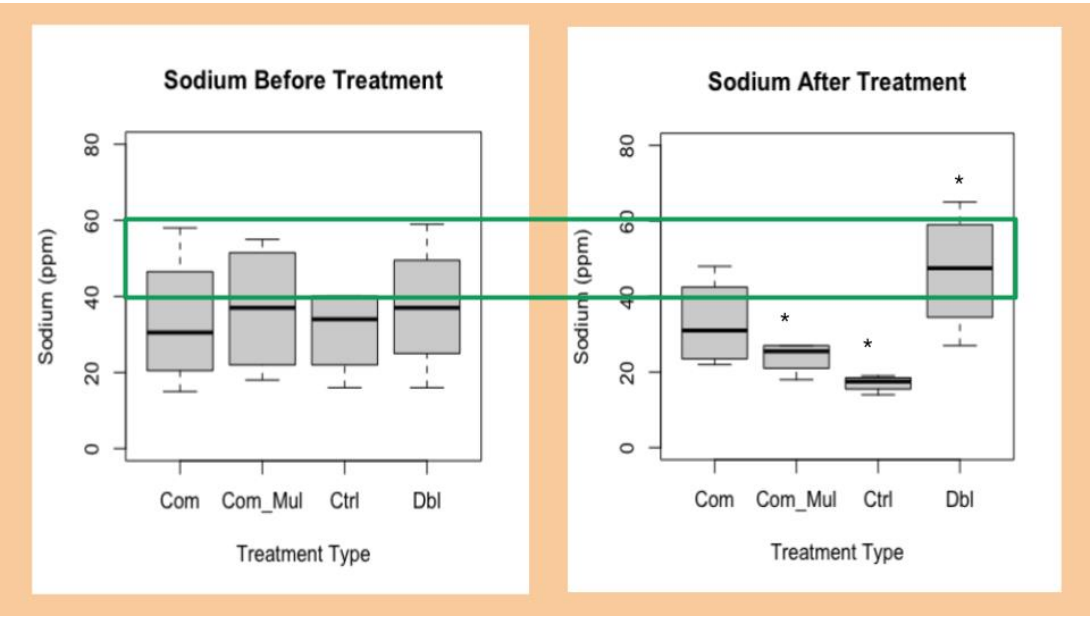


Figure 23. Sodium levels before and after mulch treatment for each of the treatment applications. Asterisks represent medians that are statistically different from each other within each of the graphs. Green box represents the recommended Sodium range.

Compost application in soils have either been shown to leave sodium levels stable or even lower sodium levels (Crohn, 2016). In fact, they are sometimes recommended to remediate sodic soils. In contrast, high levels of sodium can be associated with creating nutrient imbalances and even plant toxicity. However, high levels of salts resulting from fertilizer application are typically not within a harmful range unless they are coming in direct contact with seeds or growing plants (Magdoff & Van Es, 2009). In addition, the overall benefits of compost have been shown to outweigh the potential risks of increasing soil salinity (Magdoff & Van Es, 2009; Reddy & Crohn, 2012).

Conclusion

In years with late snow, I am still pruning into early Spring when the flowers are starting to open up. Every day, I see them getting closer to opening, I try to spot the first open flower in the orchard. Suddenly, one sunny day the flowers open en masse and bees are working hard to find the tiny (to me) drop of nectar in each flower. I now know that different bees can have varying effects on the flowers that ripple out to affect the ripening and size of the peaches depending on their unique behaviors. In a similar way, this mulch study had a ripple effect that led to exploring all the topics in the previous chapter leading up to this.

There are many options for managing an organic orchard floor, all of which have associated tradeoffs. I compare organic compost mulch application both because it was locally available and due to evidence in literature reviews. Previous studies in peach orchards have shown that compost can replace chemical fertilizers to maintain nutrient balance in the soil. The comparison between treatments of control, compost, compost

with wood chips, and double compost in my experiment did not result in many changes in nutrients over the course of one year. Most nutrients did not show significant differences with the exception of potassium and sodium. This also means that most nutrient levels remained stable and were not depleted over the course of this experiment.

Different treatments did not lead to significant differences in organic matter content either. Although there was an overall increase in organic matter between the years, this change happened across the board, including the control group. Explanations for this overall increase in SOM can include fertilizer application and grass clippings returned to the soil. It is also possible that there was not enough time elapsed to observe differences between organic matter as one of the studies listed above did not show differences in SOM until the third year of the study.

The only observed significant differences between treatment groups were for two salts: potassium and sodium. The double compost application had the highest increase for both. In both cases values did not reach concerning levels. The buildup of salts is not of high concern for this region at those levels; however, it is a good reminder to consider and monitor buildup of nutrients, or other components in the soil from compost application. It would be worth including tests for heavy metals as some studies using compost were cited above to lead to their buildup, particularly for Zinc and Copper. On review of the nutrient and content analysis from our compost supplier, it does appear that their compost contains Zinc and Copper in the low to normal range.

Chapter 6: Conclusion

This walk through the orchard allowed us to zoom between the micro and macro perspectives that encompass growing a peach as the seasons changed. The narrative provided a context to share the scope of my investigation, which is informed by my cultural values as a Xicana. While harvesting a peach early one summer morning, I saw the sun in the sky filtering through the canopy of the peach leaves. The peaches looked like glowing sunset orbs in their orange glory. I considered how the peaches looked like little suns, and in a way-- they were little suns. They are the captured energy of the sun that gets transformed over and over. That peach energy from the sun is transformed into nutrients for my community and it all cycles round and round.

Similar strands are braided together which form interconnections between different energies in my peach orchard. This includes stories of my abuelito enduring hardships as a Bracero, which inspire me to weave in shifting narratives of creating a food system in which my Mexican family and friends can inhabit safe spaces within agriculture. The strands stretch back into time weaving in my cultural traditions and protocols. The three main strands of this braid are based on positionality, philosophy and practice.

What began as a straightforward mulch study to compare organic mulches in my commercial peach orchard, transformed into a narrative of the seasons in the orchard with extensive context braiding strands of positionality, philosophy, and practice. With the use of Indigenous methodology like the metaphorical mind, each season revealed patterns and served as an analytical framework for each chapter.

In the Summer, I bite into a juicy peach, considering different ways of knowing to understand the phrase “Eat Peaches ‘til you become a Peach”. Here, I present the context of the peach by introducing myself, the history of agriculture, and the indigenization of academia. I contextualize this work rooted in my identity as a Xicana by introducing myself and my family lineage. This shifts and deepens the focus on positionality to make the work personal. I make space for the reader to consider the deep and painful implications of historical trauma associated with agriculture for BIPOC communities. I intentionally write this history without a specific resolution to point out the current inequities and to allow the reader to sit with this until it’s revisited in the Winter chapter. I present different ways of knowing based on Indigenous epistemology to cue the reader into my methodology of storytelling, metaphorical mind, and circular thinking.

As the shadows get longer in the Fall season, decomposition is the main image of this chapter centered around interconnection, networks, and a concept of duality rooted in the cultural knowledge of a compost deity, Tlazolteotl. The concept of interconnections is reflected in the Indigenous axiology that centers on relational accountability. I present a thematic analysis of three interviews I conducted with organic orchardists in the Hood River Valley to discuss knowledge networks, informal knowledge, and harassment. Emergent themes cover concerns for climate change and financial burdens expressed by organic orchardists. Thematic analysis of interviews is situated within the history and regional specificity of the Hood River Valley.

The Winter chapter is a response and contrast to Summer chapter in both activity and content. The peach trees lose their leaves and enter a period of dormancy. The need for trees to experience rest and dormancy sets the backdrop to understanding the

importance of rest. Winter dormancy helps examine the concept of rest as revolution through the analysis of public interviews of three Black women activists. I share inspiring stories of three more women who address the racialized history of agriculture by conceiving of new narratives and landscapes that allow us to envision reciprocal and equitable relationships with agriculture for BIPOC communities.

Finally, we arrive in Spring renewal. Spring presents a new opportunity for growth and renovation as the peach trees awaken from the winter rest. In this chapter, I illustrate an experimental mulch study I conducted in my organic peach orchard. I compare nutrient analyses between three different compost treatments to find that there were no significant differences in organic matter and for most nutrients besides potassium and sodium. I did not observe nutrient deficiencies in any of the measurements, which was reassuring those levels were maintained.

This thesis was oriented around my cultural values which require me to consider how I will apply the research throughout the process. One of my approaches to this was to conduct interviews as a form of cooperative inquiry and relationship building in my orchard community. I have also amplified the voices of organic orchardists in my area by engaging with a non-profit organization in the area that will be conducting a new survey on farmers needs in the Hood River Valley, along with partners from OSU and WSU. In addition, I have accepted the Viviane Barnett fellowship for BIPOC food system leaders to build my leadership skills and build networks with other BIPOC leaders in my area. I look forward to finding more ways to share and present this work.

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Appendix A

Critical Understanding of the Interview
(Interview questions at the end of this section)

Method vs. Methodology

My methodology reflects a combination of approaches from social science literature and Indigenous axiology and protocols. I weave back and forth between them, presenting them side by side. I use conventions of social science interview methods such as contacting key informants, snowball sampling, and human subject review protocols. I review core literature on ethnographic research such as Charles Briggs' Learning How to Ask: A Sociolinguistic Appraisal of the Role of the Interview in Social Science Research. Brigg's work provides a foundation to my interview analysis process by probing basic assumptions such as positionality, reliability, validity, and scientific colonialism (Briggs, 1986). Positionality is a point of intersection between Indigenous research methodologies and social sciences. Indigenous protocols include consideration to relational accountability, reciprocity, and responsibility. Both methodologies center on acknowledging social, political, and cultural components of research.

I distinguish between methods and methodologies in order to identify areas where bias enters research. Methodology is the sum process where data is collected, analyzed, and interpreted. As a result, methodologies shape the "portrait of realities that statistical techniques eventually create" (Walter, 2013, p.10) (Walter & Andersen, 2013, p.10) because they determine why and how questions are asked, what methods are used to explore it, and eventually how that information is used. Methods are the tools employed for research such as conducting interviews.

"Every research methodology has an umbilical origin" (Minthorn et al., 2018, p.15). Upon reflecting on my positionality, I have come to the conclusion that this aspect of research is of utmost importance because our views and our experiences shape our interpretations, our responsibilities and our choices. As masters students, our research topic reflects deep desires that drive us to hours, days and years of focused research. This focus and determination is connected to a passion that drives us whether it be to obtain the actual degree or because we care deeply about the matters we choose to study.

As a Xicana, organic farmer I care deeply about my responsibility to the earth and relationship, be it with nature or with my community. Throughout my research I explore how the values encoded in me have informed the methodologies I choose to employ in my research. I refuse to separate my research from the communities I am part of. As one of my teachers Rowen White from the Mohawk nation would say "I am a woman who walks two worlds" and so as a woman who walks to worlds, I can move between them to gather unique insight to each of those worlds.

My research deals with all of these explicitly, challenging the dominant narrative of natural science thus:

1. How the questions are asked: The questions are asked from the perspective of someone that knows the community and is part of the community. This allows me to identify themes and challenges as well as establish a sense of trust with interviewees.
2. How the information is explored: Using both literature review as well as interviews to incorporate local knowledge and networking. Not only recognizing

varying cosmologies that influence other farmers but recognizing the cosmologies that influence my approach and interpretations.

3. How that information is used: Through the process of interviewing, I am actively forming networks with the community and offering to give back by the information that I'll share with them as well. This is also manifested by my sense of responsibility to the people that have donated their time to make my research possible.

Accountability vs. Anonymity

The interview process intentionally includes me as an active participant in the exchange of organic orchard management practices. I drafted questions to explore the extent to which orchardists rely on centralized sources of information from government agencies, academic institutions, local sources, other farmers, and on-farm experiments. By incorporating mostly open-ended questions and allowing for tangents to be expressed, the interviewees guided relevant themes associated with access to organic management information. Along the way, themes outside of this scope emerged, allowing the interviewees to be co-authors of this process. This approach contrasts with the more common top-down linear transfer of knowledge. "The point is not to eliminate the effects of the researcher's own presence, a fruitless and theoretically unsound goal" (Briggs, 1986). The overall goal was to present an image of the experience of an organic orchardist in Hood River, Oregon.

Human Subject Review

My interview questions had to be reviewed and approved by the Human Subjects Review Committee at The Evergreen State College. This involved discussions with my advising professors and detailed answers to questions concerning the confidentiality of interviewees. The recommendation from his process was to exclude any identifying information.

In contrast, Indigenous methodologies support relational accountability through recognizing and naming people and describing relationships. Although this was not possible for the scope of my work, I include relational accountability in the relationships I've built with the people I interview. In addition, it is my intention to connect with the reader by introducing aspects of myself into the narrative of this work.

Sampling

Convenience sampling and snowballing. Prior to this study, I already had a network of organic orchardists to build a list of potential interview participants. I then looked up all organic orchards in the Hood River Valley I could find by conducting an online search. During interviews, I asked if participants could suggest other organic orchardists who they thought I should interview. I reached out to a total of 7 orchardists and conducted interviews with 3 of them. Two of them declined to be interviewed. The other two I was not able to find a mutually available time after the start of the Pandemic.

Key informants

I reached out and met with two key informants, both of whom were not organic orchardists themselves. Both were Extension agents at the time and had key information

that provided me with survey information for the region as well as advice on experimental design.

Notes on Orchardists who Declined

Due to Covid, it became increasingly challenging to set up interviews both because of the changes I had to juggle with running the orchard as a business and likely the same with those who I wanted to interview. One of the orchards I contacted to request an interview declined by stating that they did not consider themselves "organic" because the term was too limiting, and they felt their practices went beyond that concept. I reflect on this comment by considering the fluidity of (and lack of) identities and labels. While identities and labels can be useful guides, they are often not accurate representations and in this case, this person rejected the term "organic" overall because they felt it didn't match their orchard identity.

Covid pandemic

The Covid pandemic began during the time that I was conducting interviews in Spring 2020. I had conducted two of the interviews prior to that in person. The final interview had to be conducted over the phone. I had planned to interview more orchardists, however, with new challenges for orchardists and everyone, it was increasingly challenging to find an appropriate time or place for an interview.

Interview Questions

Intro/Demographics

1. How long have you been managing or working in orchards?

2. Did you grow up around orchards?
3. How did you get involved in orchard work?
4. What is your connection to this orchard, are you an owner/operator/worker?
5. Do you know who was farming it before you?
6. Have you had any formal training in orchard management?
7. What is your educational background?

Management Decisions

1. What is the reason that this orchard is managed with organic methods?
2. How have you learned how to manage this orchard?
3. What information resources have you used to support how you manage the orchard organically? (such as books, online resources, other people)- wait for response before suggesting these options
4. Have your practices changed from when you first started managing this orchard? How?
5. Do you stay informed about new practices and new options for management? How?
6. Do you find there are many resources that support organic practices?
7. What is the best source of advice or recommendations for management practices for you?
8. With whom do you share and exchange your knowledge on orchard management? In what setting?
9. Do other farmers share information with you on organic orchard management practices?

10. What do you envision as a more effective way to share methods of organic orchard management?
11. What other forms of information could benefit your organic operation?
12. Do you think compost application is a reasonable way to manage an orchard floor?
13. Are you interested in learning about the results on my mulch experiment?
14. What method would be most effective to share that information with you?
15. Can I contact you by phone or email with any further questions as I continue on my research?

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Appendix B

Peach Tree Pruning

People have pruned fruit trees for thousands of years and as a result there are many approaches, some which will offer conflicting advice. The most important part is to develop a relationship with your tree and understand how the tree will react to your cuts. This comes with time and experience. Here are basic steps that can get you started with pruning peach trees.

- General aims of pruning:
    - Control size
    - Remove disease and renew tissues
    - Allow light to penetrate to every fruit surface
    - Good airflow in the canopy
    - Control fruit load
    - Remove old branches and create better structure
- Peach trees are pruned heavily every year due to:
    - Fruit grows on one-year wood
        - One-year old wood is new growth from the summer
        - Typically, these branches are red colored and covered in buds
    - Peaches tend to form dense canopies
        - Dense canopies build more moisture and more opportunities for pests
- We use an open-vase training system
    - There are various pruning systems (more detail at the end) but our trees are trained to grow in an open vase which:
        - Opens up the center of the canopy to reduce moisture and pest occurrence including insect and fungal issues
        - Allows light to reach the peach more directly

- Weight distribution
- Easier for sprays to reach most of the surfaces of the tree

Practical Guide

Before and after pruning photo of our orchard:

First, orient yourself to this photo. Notice the difference in height and pay close attention to how open the center of the tree appears. Envision an open vase/wine glass shape. Note that many of the vertical branches are removed and the thinnest (fruiting) branches are all similar length.

Basic Steps

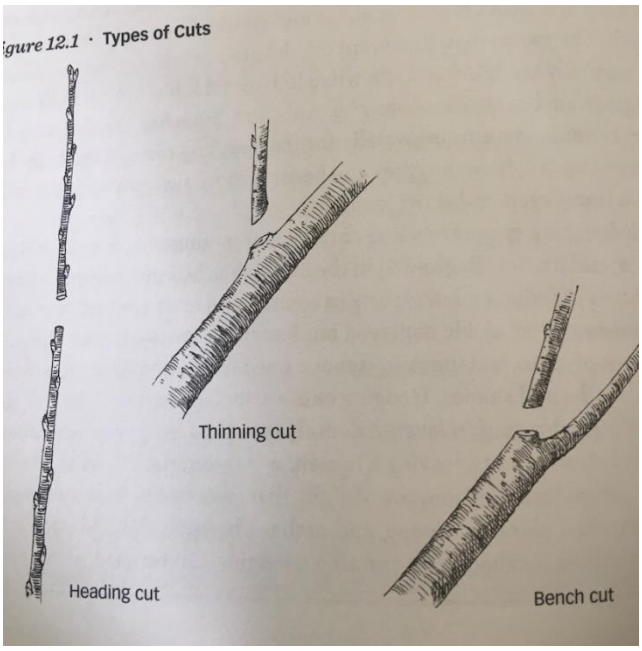
1. Familiarize yourself with the tree. Stop and assess the tree as a whole ask:
    a. Where is the new growth?
    b. Is there a balance of the new growth?
    c. Is there fruiting wood lower down on the tree?
2. Remove branches that are dead/dry damaged
3. Remove branches growing straight to the inside of the tree
4. Remove sagging branches angled lower than the horizon
5. **Stop** and reassess the whole tree
6. Favor branches growing out at 45 degrees from center
7. Head fruiting branches to about 8 inches long

And always ask me questions!

How to Cut

The general goal is to make a cut that the tree can heal up easily and prevent entries for pathogens. Placement and angles of cuts are the two most important factors. It's also important to consider if you can achieve the same results with less cuts and smaller cuts.

3 Types of Cuts



(Barney, 2013, p.412)

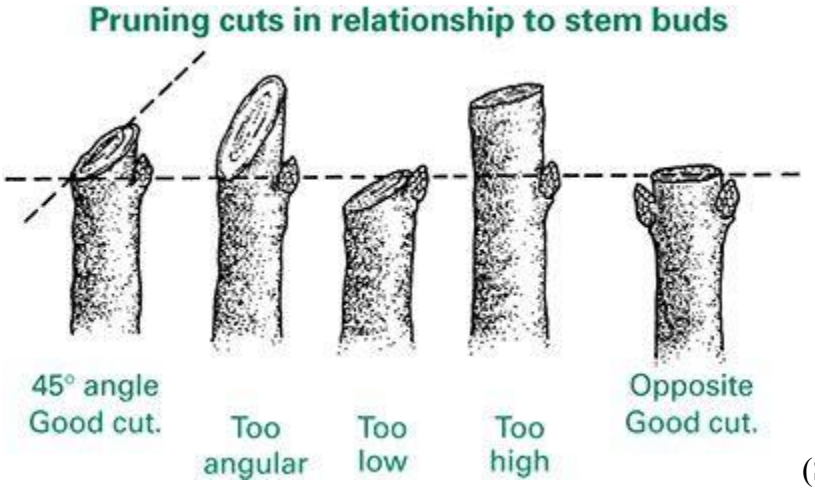
1. Heading
    a. Removes the top portion of a continuous segment of branch
    b. Consider: This will usually result in new branches just below the cut
2. Thinning
    a. Thins out smaller branches from a larger one
    b. Focuses growth to the main branch remaining
3. Bench
    a. Redirects growth into a neighboring branch
    b. Structurally weaker cut

Where to Cut

Where you cut the branch will determine how easy it is for the tree to heal. You want to leave enough tissue for the tree to close the wound but not too much of a stump that it promotes growth where you don't want it. Cut at an angle so that water droplets will roll off and not collect at the tops.

Things to consider:

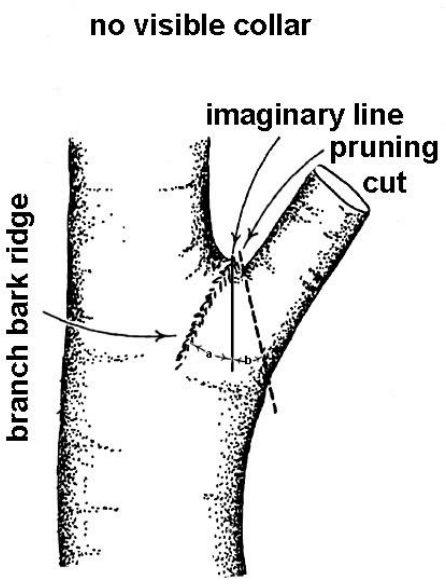
- Bud position
- Angle of cut
- Stubs left



(Swanson's Nursery, n.d.)

Cut near the collar (see image of collar below)

1. Why?
    a. Too long and you will get more growth in that area next year
    b. Too short and it will be harder for the tree to heal



(University of Florida, n.d.)

Sawing Large Branches

1. First remove the weight of the branch further out
2. Then clean up your cut up to the collar

NOTE!!

If you are having trouble getting a clean cut or must apply too much force, your tools are dulling and it's time to sharpen.

Video (HIGHLY recommend watching)

https://www.youtube.com/watch?v=u42z2WuC4Nw

Timing:

Most of our pruning is carried out in the dormant season but we also do maintenance summer pruning when time allows. Dormant pruning invigorates and stimulates new growth and allows us to visualize the whole shape of the tree without leaves. However,

dormant pruning can stimulate too much growth and can also leave wounds open to pathogens for longer periods of time.

Other pruning systems:

Other pruning systems include: modified vase, multi-scaffold, natural open center, and modified central leader. High density orchards will typically use a central leader system in order to reduce labor. There are also V and Y scaffold forms which are common in new orchards.

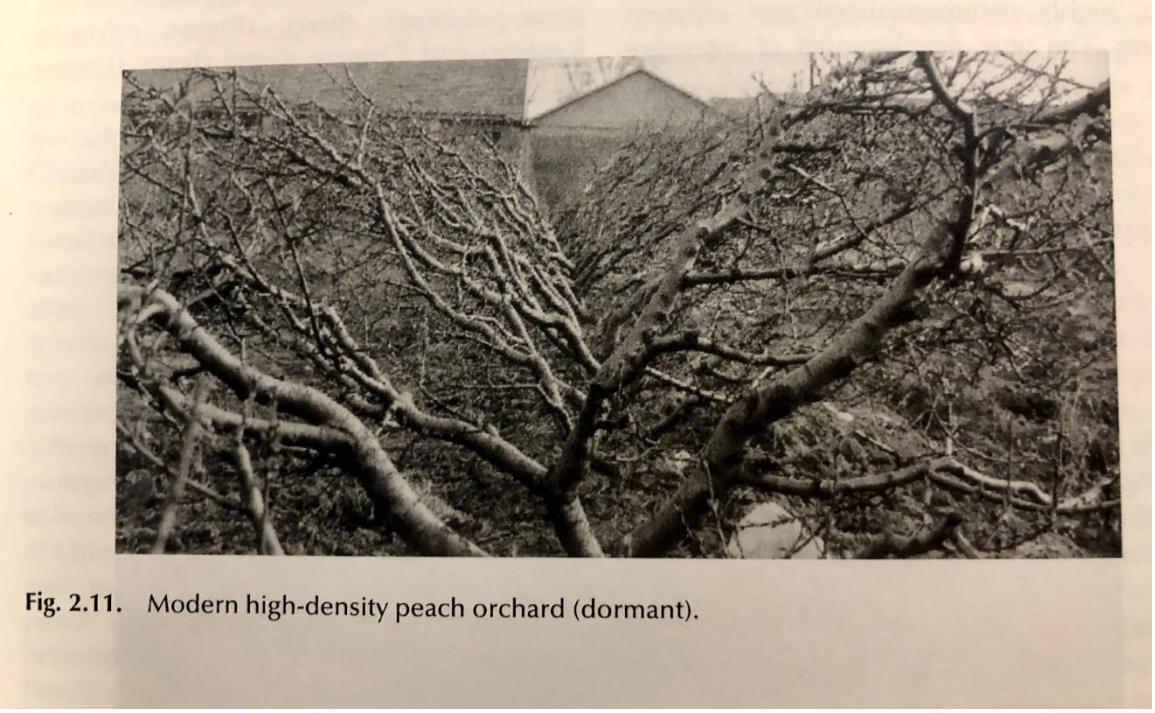


Fig. 2.11. Modern high-density peach orchard (dormant).

(Layne & Bassi, 2008, p.53)

Important to note that different varieties of peaches will have slightly different growth habits and will impact how you approach pruning that tree other important factors

include age, disease, and spacing. Rootstock variety is also an important determinant in the height of the trees. In our orchard, our rootstock is a dwarf variety, so we're able to keep the trees at pedestrian height so there's little need for ladders when working with them.

Overall Process:

My philosophy: First and foremost, remember your decision impacts the whole future of this tree, so you want to approach it with respect and caution especially at first while you're learning. Working with trees is establishing a relationship with them, and as with developing good relationships you listen and learn to communicate. This is why pruning is a years long process but with some guidance you can get started on learning this language. They do the magic of producing peaches and we tend to them. I see agriculture as an ancient agreement with plants that comes with certain responsibilities, but I digress…

Appendix B Bibliography

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