1-19-2022

The New Shiny Penny? Regenerative Agriculture Beliefs and Practices Among Portland's Urban Agriculturalists

Melia Ann Chase
Portland State University

The New Shiny Penny? Regenerative Agriculture Beliefs and Practices Among Portland's Urban Agriculturalists

by

Melia Ann Chase

A thesis submitted in partial fulfillment of the
requirements for the degree of

Master of Urban Studies

Thesis Committee:
Megan Horst, Chair
C.N.E. Corbin
Alida Cantor

Portland State University
2021

Abstract

Regenerative agriculture (RA) is a set of farming and land management practices intended to support or enhance soil health and carbon sequestration potential of soils while producing food, fiber, or other agricultural products. It has received broad acclaim from scholars, corporations, and governmental bodies as a potential means of sequestering carbon and mitigating climate change impacts. It has also received critique and pushback for its vague definition, shifting metrics, and lack of acknowledgement of the Indigenous practices underlying the modern suite of regenerative practices. The purpose of this research is to investigate the beliefs Portland, Oregon urban agricultural practitioners hold on the topic of regenerative agriculture, as well as to determine whether members of this group are employing any specific regenerative agricultural practices or means of measuring the regenerative impact(s) of their projects. Drawing on a set of interviews with 13 urban agricultural practitioners, this research finds that those working in the field of urban agriculture in Portland have their own critiques of and alternative approaches to regenerative agriculture, offering major critiques around 1) the limited acknowledgement of the deeper history of common RA practices, 2) the uncertain efficacy of measuring regenerative impacts through soil carbon testing, 3) the rise of RA as an institutional buzzword, and 4) the compatibility between stated RA soil carbon sequestration goals and urban agricultural practices.

Acknowledgements

My thanks first and foremost to my incredible committee and particularly to Dr. Megan Horst for her invaluable support through a thesis process that unexpectedly included a global pandemic. Thank you to my interviewees who took time out of a busy and strange spring season to share their thoughts with me. Enormous gratitude as well to the team at Foglight Farms for making the completion of this thesis possible, and for giving me a chance to put theory into gorgeous practice. Thank you to my friends and family for their listening ears as I developed my knowledge on the topic of regenerative agriculture. And finally, all my thanks to Jamie and Joplin for their unwavering love.

Table of Contents

List of Tables

List of Figures

Chapter One: Introduction

Regenerative agriculture (RA) is frequently defined as a set of farming and land management practices intended to support or enhance soil health and carbon sequestration potential of soils while producing food, fiber, or other agricultural products (Elevitch et al., 2018; Luján Soto et al., 2020; *Regenerative Organic Agriculture and Climate Change*, 2014). Regenerative agriculture has received scholarly, governmental, and corporate attention as a possible means of mitigating the climate impacts of industrial agriculture (*Carbon*, 2021; Kane, 2015; *Startups Aim to Pay Farmers to Bury Carbon Pollution in Soil » Yale Climate Connections*, 2020). However, a precise definition of what constitutes RA is still in dispute (Fassler, 2020; Newton et al., 2020). Research into RA has predominantly focused on 1) practices implemented on large, peri-urban or rural agricultural sites and 2) soil carbon sequestration as both the goal and metric of success (Bradford, 2019; White, 2020).

Less research has been done into the use and impact of regenerative agricultural practices on urban farms (Kulak et al., 2013; Lal, 2014). Urban agriculture (UA) tends to differ from rural and peri-urban agricultural sites in several key ways, which may impact the use of RA practices on UA sites as compared to their rural counterparts. RA recommendations geared towards large, rural farms and farmers focus on making soil-building practice changes at scale; because urban agricultural sites tend to be much smaller in size (McClintock & Simpson, 2014), these changes recommended by researchers and experts for large farms may not apply. This research addresses this gap

by investigating what regenerative practices are employed by Portland's urban agricultural organizations.

Additionally, there is very little research investigating urban agricultural definitions of and beliefs related to RA (Anderson, 2019; Rhodes, 2012). One purpose of this research is to investigate the beliefs Portland, Oregon urban agricultural practitioners hold on the topic of regenerative agriculture, as well as to determine what definitions this group uses for RA.

Finally, soil carbon sequestration as the primary goal of RA is a topic of debate among scholars and practitioners (Fassler, 2021; Tautges et al., 2019). Some tout soil carbon sequestration as a promising means of widespread climate change mitigation (Anderson, 2019; *Regenerative Organic Agriculture and Climate Change*, 2014; Toensmeier & Herren, 2016), including advocates that claim that RA practices, widely adopted, have the ability to outpace emissions and reverse climate change through soil carbon sequestration (*Regenerative Organic Agriculture and Climate Change*, 2014). However, other researchers have raised doubts about this possibility, among them uncertainty that RA practices can offset existing chemical and mechanical agricultural practices in emissions (Mock, 2021; Schlesinger & Amundson, 2019), limited scientific understandings of soil carbon capture over the long term (Yang et al., 2021), and fears that future land use turnover will undo any soil carbon sequestration (Fu, 2021; Tautges et al., 2019).

Urban agricultural organizations and practitioners tend to differ from rural farms and farmers in missions, values, and social identities (Dobernig & Stagl, 2015;

McClintock & Simpson, 2014) and may not employ the same metrics of success as rural agriculturalists or researchers focused on large scale rural sites. This research addresses this gap through direct interviews with urban agriculturalists to ascertain the metrics Portland's UA organizations are using to measure their regenerative impact.

This research is in part inspired by the inaugural round of the Portland Clean Energy Fund (PCEF) grant application. Portland Ballot measure 26-201, the Portland Clean Energy Initiative, passed in November 2018. The measure leverages a 1% business license surcharge on large retail corporations operating within the Portland city limits, with exceptions for grocery stores, medicine, and healthcare services. Money raised by the surcharge is pooled into an annual grant fund, which is anticipated to eventually disperse up to $50 million annually to nonprofit organizations that are led by and focused on serving communities of color and low-income communities working to address impacts of climate change (*Portland Clean Energy Community Benefits Initiative*, 2018). Up to 15% of PCEF's annual funds are earmarked for RA and green infrastructure projects (ibid.). The measure text of the Portland Clean Energy Fund defines regenerative agriculture as "farming and land management practices that reverse climate change by rebuilding soil organic matter and restoring degraded soil biodiversity" (ibid.). However, they do not delineate which specific agricultural practices would be considered "regenerative," asking instead that applicants describe which of their practices are regenerative in nature (*PCEF RFP Attachment A*, 2020).

The PCEF grant application relies on the applicant organization to report the size of the agricultural site devoted to RA practices. PCEF staff then use the area to calculate

potential carbon sequestration of the site (ibid.). Given the uncertainty among scholars and practitioners as to the real carbon sequestration impact of RA practices over time, this means of measuring regenerative impact of urban agricultural sites may or may not be appropriate. This research seeks to provide evidence for an urban-specific RA practice in Portland that could be useful in building and refining policies and institutional supports for urban and regenerative agriculture.

In this thesis, I first review the existing literature on RA, with a particular focus on the differences and similarities between RA as defined by researchers and practitioners and other related terms and fields of study, including sustainable and organic agriculture, permaculture, and agroecology. I discuss current major thought on measurements of RA impacts, particularly soil carbon sequestration. As this thesis is partially inspired by the Portland Clean Energy Fund, a governmental fund that provides financial support in exchange for regenerative agriculture outcomes, I discuss the concept of Payments for Ecosystem Services and its potential utility as a means of valuing RA practices and outcomes. Finally, I explore literature on the many facets of UA, with a particular focus on which Portland UA organizations could be eligible for RA funding via PCEF.

The crux of this thesis is eleven interviews I conducted with thirteen Portland-area urban agricultural practitioners in spring 2021. Through semi-structured interviews, I sought to answer three primary research questions, namely:

- How do Portland's urban agricultural practitioners define regenerative agriculture?

- What practices associated with regenerative agriculture are Portland's urban agricultural organizations currently employing?
- What metrics are Portland's urban agricultural organizations using to measure their regenerative impact?

In this thesis, I discuss their answers and emergent themes, including tenuous relationships between nonprofit urban agricultural organizations and institutional forms of support, skepticism towards shifting popular terminology and quantitative measurements of regenerative impact, beliefs about the utility of RA as a term applied to urban specific agricultural practice, and personal, spiritual, and cultural beliefs on the connection between people and agricultural space that underlies the concept of RA and related terms. I conclude by offering suggestions for strengthening the realism and accessibility of the Portland Clean Energy Fund as intended for RA projects, and for additional institutional and community-based steps that could work to increase beneficial impacts of existing RA projects in Portland and open the door for more.

Chapter Two: Literature Review

This literature review begins with the history of the term regenerative agriculture and current major research questions related to its rise as a movement and topic of research interest. Given RA's similarities to other agricultural movements, I discuss the shared histories and differences between RA, organic agriculture, sustainable agriculture, agroecology, and permaculture. RA stands apart from these other agricultural movements in part due to corporate and governmental initiatives to apply cap and trade markets to its potential soil carbon sequestration benefits – to illuminate this trend, I discuss current methods of measuring soil carbon and the concept of ecosystem services and payments for ecosystem services. To connect RA to the urban agricultural sites, practices, and missions of my interview participants, I discuss major fields of urban agricultural research and their relationship to Portland's urban agricultural history and current practitioners.

Regenerative Agriculture

The Rodale Institute, a nonprofit research and education organization widely considered a progenitor of the organic movement of the mid-20th century, takes credit for coining the term "regenerative organic agriculture" in the early 1980s, defining it as a form of agriculture that goes beyond sustaining soil health and instead improves it by returning nutrients and carbon to the soil (*Regenerative Organic Agriculture and Climate Change*, 2014). Some elements that the Rodale Institute identified as central to regenerative organic agriculture include closed or semi-closed farm nutrient loops (i.e.,

the use of cover crops and on-site composting), increased biodiversity of plant and animal life, and diversified crop production with a focus on perennial crops (ibid.).

Academic and institutional RA research rapidly increased in the 2010s (Newton et al., 2020), and more recent research has particularly focused on RA's potential as a means of mitigating climate change via soil carbon sequestration (*Regenerative Organic Agriculture and Climate Change*, 2014; "Soil Carbon Restoration," 2020; Tautges et al., 2019). Soil carbon sequestration is the set of processes by which atmospheric carbon enters and is stored in the soil. As plants grow, they sequester carbon in their living tissue and direct carbon to the soil via their roots. Soil bacteria and fungi then contribute to the buildup of soil carbon over time through digestive processes that result in more complex soil aggregates capable of holding more carbon. When soil aggregates are broken up, most commonly in agricultural systems via tilling, stored soil carbon is released and re-enters the atmosphere (Fassler, 2021; White, 2020). Soil carbon sequestration may be measured over time through soil carbon/soil organic matter testing (Sullivan et al., 2019). However, soil carbon testing has also received critique for being expensive, inaccessible to farmers, and variable in its accuracy (Elevitch et al., 2018; Johns, 2017; Welsch et al., 2019).

It is notable that the focus on soil carbon sequestration comes both from scholars (Luján Soto et al., 2020) and from major corporations and start-up businesses interested in monetizing the process or impact of soil carbon sequestration (*Harnessing Nature to Help Farmers Sustainably Feed the Planet*, n.d.; *Startups Aim to Pay Farmers to Bury Carbon Pollution in Soil » Yale Climate Connections*, 2020). Most recently, the United

States federal government has begun investigating the prospect of paying farmers to employ regenerative practices in pursuit of greater soil carbon sequestration in agricultural lands (*Carbon*, 2021; Fassler, 2021). The systems proposed by the federal government and for-profit industries to pay farmers for carbon sequestration bear much in common with other carbon cap and trade systems, in which polluting industries, agricultural or not, can purchase credits from companies that have reduced their emissions instead of enacting any emission curbing protocols of their own (Fassler, 2021).

Despite the high level of interest and potential funding being channeled into RA, there exists huge disagreement within the existing literature as to the core definition of "regenerative agriculture." An illuminating review by Newton et al. (2020) looked at 229 scholarly articles and 25 practitioner websites to ascertain existing definitions of RA. They found wide disparity in existing definitions, including practitioners who described RA as "undefinable." Those definitions they did receive they divided into "process" and "outcome" related definitions. Process definitions were those that focused on the practices or processes that the researcher or practitioner saw as integral to RA, which included the integration of livestock, cover cropping, low or no-till farming, and reduced use of pesticides and fertilizers. Outcomes based definitions did not described individual practices and focused instead on the goals of RA, most commonly improved soil health, carbon sequestration, improved water systems, increased biodiversity, and improved community health and wellness (Newton et al., 2020).

It's an impressive list of practices and potential benefits, but neither the Rodale Institute nor current practitioners of RA can take credit for discovering any of them. No-till and low till agriculture, cover cropping, livestock intergrazing, closed loop composting, and many other less commonly noted "RA" practices have been employed for generations by agriculturalists, and particularly by agricultural communities blocked from participation in major governmental and corporate funding streams by racist policies and actions (Fassler, 2021). Black agricultural researchers in the late 19th century, George Washington Carver forefront among them, encouraged the use of nitrogen-fixing cover crops and the application of compost to revitalize soils. Carver recognized and championed soil restoration as integral to both ecological and social health for Black sharecroppers forced into the annual production of monoculture cotton in service to white landlords (Baker, 2021). In their book "Farming While Black," (2018), Penniman & Washington discuss traditional agricultural practices of Haiti, Kenya, Namibia, and Angola that balance production and soil reinvigoration and that closely mirror practices associated with RA today.

In addition, perennial-based agriculture as recommended by the Rodale Institute shares much in common with the tenets of agroecology and permaculture – themselves traditional Indigenous growing practices repackaged by predominantly white academics in the latter 20th century (Anderson et al., 2021; Deaconu et al., 2021; Hathaway, 2016), a fact that the Rodale Institute acknowledges ("The Leaders Who Founded the Organic Movement," 2021). In fact, the suite of practices now commonly associated with RA has been packaged and repackaged, with minor adjustments, several times over the past

century. Before the use of RA to describe soil-care and closed loop practices, other terms including organic agriculture, sustainable agriculture, permaculture, and agroecology rose to prominence. All share commonality of at least some practices, as well as origins in opposition to industrial or chemically intensive agriculture (Fassler, 2021; Ferguson & Lovell, 2014; Pilgeram, 2013; *Regenerative Organic Agriculture and Climate Change*, 2014; Wezel & Soldat, 2009). Initial use and founders, definitions, associated practices, and prominent critiques of RA, organic agriculture, sustainable agriculture, agroecology, and permaculture are shown in the table below.

Table 1: Comparison of RA, Organic Agriculture, Sustainable Agriculture, Agroecology, and Permaculture.

Term	**Credited Founder/Year**	**Definition**	**Practices**	**Critiques**
Regenerative Agriculture	Rodale Institute - 1982	"a kind of farming that goes beyond simply 'sustainable,' [and] takes advantage of the natural tendencies of ecosystems to regenerate when disturbed."	No till or reduced tillage, cover cropping, compost application, crop rotation, livestock integration, perennial production, low or no chemical inputs, reliance on ecological principles	Unclear definition; lack of credit to Indigenous and Black innovators of growing techniques and lack of focus on social components of agriculture; unclear if regenerative practices should be layered onto sustainable/organic practices or if they are separate

Organic Agriculture	Rodale Institute – 1940s)	Growing practices that build soil fertility naturally and without reliance on chemical inputs	Composting, cover cropping, no synthetic fertilizers or pesticides, Integrated Pest Management	Reliance on tillage; practices watered down due to corporate pressure; compromises in certification program; lack of attention to conditions of agricultural workers and reification of existing social injustices
Sustainable Agriculture	Brundtland Commission – 1987, as "sustainable development," quickly extrapolated to "sustainable agriculture."	Agriculture "that meets the needs of the present without compromising the ability of future generations to meet their own needs."	Broadest list of practices – existing term that is most open to modification to fit the practices of the practitioner	Unclear definition and broad usage across practices and scales; initial definition links idea of sustainability with development; practices associated have been watered down by corporate pressure; lacks attention to conditions of agricultural workers and reification of existing social injustices; focus is on sustaining, not improving soil health
Agroecology	Czechoslovak Botanical Society – 1928	"The integrative study of the ecology of the entire food systems, encompassing ecological, economic and social dimensions, or more simply the ecology of food systems."	Diversified crop and livestock production; Indigenous growing methods from many cultures; pest management via ecosystem management; perennial crops; closed-loop nutrient cycling	Shifting scale of focus over time; conflicting uses as a scientific discipline, social movement, or set of agricultural practices

Permaculture	Bill Mollison and David Holmgren, 1978	Form of agroecology, portmanteau of "permanent" and "agriculture" or "culture," defined: "consciously designed landscapes which mimic the patterns and relationships found in nature, while yielding an abundance of food, fibre and energy for […]local needs"	Perennial cropping; whole systems design using crops and livestock drawn from a global species pool; water conservation via contour swale building; diversified production; localism and community building	Understudied and poorly integrated into agroecological research; overblown claims of impact made by proponents; conflicting use as a set of practices or social movement; centralizes writings and perspectives of white, male founders over diverse cultures originating practices

There are many other terms and movements that overlap with RA – among them carbon farming, biodynamic farming, agroforestry, and diversified farming systems – however the terms in the table above have been given greater focus due to their widespread comparison to RA in existing literature (Anderson, 2019; Fassler, 2021; Newton et. al., 2020). Some have argued that the term RA is critical because "regenerative" denotes a level of care and soil improvement beyond "sustainable," or organic (Anderson, 2019; White, 2020). However, given the high level of definitional overlap between RA and other, older terms, some have argued that RA is merely a redux of other terms and movements, but with less input from practitioners, particularly Indigenous and Black communities and agriculturalists (Fassler, 2021). Fassler (2021) situates agroecology and forms of agroecological practice, like permaculture, as preferential to RA due to their crowd-sourced definitions and longer history of Indigenous recognition. This research seeks to add to the discussion on term preference

and definition by determining the preferred terms and RA definitions used by Portland's urban agricultural practitioners.

One clear and important distinction between RA and similar terms is the high value placed on RA's soil carbon sequestration potential specifically, versus a focus on a suite of ecological and cultural benefits in permaculture, agroecology, and SA discourse (Bradford et al., 2019; Fu, 2021). However, as noted, there is an ongoing debate on how to best measure soil carbon, and whether RA practices are successful in sequestering soil carbon in the long term. In the next section, I discuss current suggestions for measuring regenerative agricultural impacts, with a particular focus on forms of soil carbon testing.

How is RA Measured?

Metrics to evaluate the efficacy of regenerative agricultural practices vary in practicality and accessibility. These include quantitative metrics, such as measuring soil carbon levels or microbial biomass, and qualitative indicators, such as crop performance, erosion control, and soil appearance (Luján Soto et al., 2020). This research contributes to the literature on measurements of RA by determining whether Portland urban agriculturalists are measuring the regenerative impact of their projects and what forms of qualitative and/or quantitative measurement are being used.

Researchers have recognized that there is not yet consensus on the most useful or tailored standards for measuring regenerative impact (Elevitch et al., 2018; Welsch et al., 2019). However, soil carbon testing has received by far the most attention as a metric for gauging RA outcomes (Anderson, 2019; Fassler, 2021; Kane, 2015; *Soil Sampling Guidelines*, 2021; Sullivan et al., 2019). Soil carbon testing is in fact an umbrella term for

three separate testing methods, often also referred to as soil organic matter testing (Sullivan et al., 2019). The three testing methods are described in the following table.

Table 2: Comparison of Methods of Soil Carbon/Soil Organic Matter Testing.

Test	**Example Cost (per soil sample)**	**Method of Testing**	**Benefits**	**Drawbacks**
Loss on Ignition (LOI)	$9, A&L Laboratories	Estimate of SOM by calculating sample weight loss after ignition at 360 degrees C.	Lowest cost; most frequently available through conventional lab testing; often included in general soil test packages	Variable results across laboratories; overestimates soil carbon when SOM is low (>2%).
Walkley-Black	$20, Cornell	Chemical testing method: potassium dichromate is applied to the soil sample and the resulting dichromate ions are quantified as a measure of SOM.	More accurate than LOI; suitable for alkaline soils.	Generates toxic chromium as a by-product; more difficult to find as labs phase it out due to chromium creation.
Dry Combustion	$30-45, UC Davis	Sample is heated to 1000 degrees C, amount of C present in the resulting gas is measured.	Most accurate test for non-alkaline soils; only acceptable test for "Regenerative Organic" certification	Offered by fewer labs due to need for specialized equipment; not suitable for alkaline soils; requires a larger sample size for best accuracy.

Soil carbon testing can be costly, particularly testing many samples or sites, as is recommended by recent research on soil sampling best practices (Fu, 2021; Kane, 2015; Welsch et al., 2019). Testing also requires adherence to a regular testing schedule (Johns,

2017; Sullivan et al., 2019), equipment able to take a soil core of the same volume through the full sample depth, and ability to sample six months after any compost or mulch addition (Sullivan et al., 2019). To simplify these variables, some companies have turned to calculating soil carbon sequestration potential using remote sensing and modeling, and not necessarily on-site conditions (Ashtekar, 2021). In growing numbers, these models are used to assign dollar values to farms' soil carbon sequestration potential and propose payment schemes to farmers for their role in sequestering soil carbon and fighting climate change (Ashtekar, 2021; Fassler, 2021; *Indigo Pays 267 Farmers in Milestone Progress for First Ever Scalable Ag Carbon Farming Program*, 2021). This system of payments for potential carbon sequestration falls in line with the concept of payments for Ecosystem Services. In the next section, I discuss the concept of Ecosystem Services, critiques of payment for ES schemes as related to RA, and the connection to the Portland Clean Energy Fund and its model of tax-funded grants for urban regenerative agricultural projects.

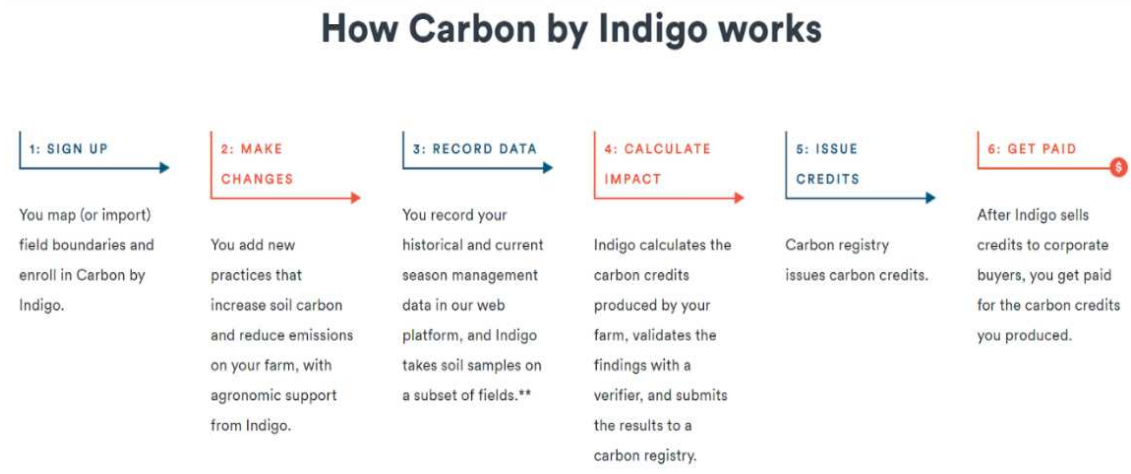
RA, Ecosystem Services, and Payment for Ecosystem Services Models

The concept of "ecosystem services" is a modern means of conveying a basic underpinning of human existence - that humans and social systems rely on and benefit from natural systems. As defined by the United Nations' Millennium Ecosystem Assessment in 2003, ecosystem services (ES) are the benefits that ecosystems provide humanity. The MEA delineated four broad categories of ES: provisioning services, such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, or

spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling (Millennium Ecosystem Assessment, 2005). RA has been investigated through the lens of several ecosystem services – among them the supporting service of nutrient cycling and the regulating service of carbon sequestration (Lin et al., 2015).

Government and private organizations have made attempts to transform conceptual calculations of ecosystem service value to actual payment schemes, called payment for ecosystem service (PES) models. An example of a PES model in the field of RA is the nascent Indigo Ag carbon market. The company announced in September of 2021 the first payments to 267 farmers for employing "practice changes," though notably their press release does not delineate what the practice changes were, just that there were "50 unique practice change combinations" among participating farmers (*Indigo Pays 267 Farmers in Milestone Progress for First Ever Scalable Ag Carbon Farming Program*, 2021).

Figure 1: Indigo Ag Carbon Market Explanation (Earn Income with Carbon Farming, 2021)



Other recent corporate RA PES models include the Ecosystem Services Market Consortium (Fassler, 2021) and the work of CIBO International (Ashtekar, 2021). In these schemes, funding to pay farmers for ES provision comes largely from major corporations – such as Danone, Cargill, and General Mills - interested in offsetting their own carbon emissions by funding the sequestration practices of farmers (Fassler, 2021).

Researchers and farmers have offered critiques of applying cap and trade style PES markets to regenerative farming. Yang et al. (2021) found that soil carbon believed to be securely sequestered can be rapidly broken down and released atmospherically by certain soil enzymes – which other RA critics have seen as a sign that we don't yet understand soil carbon sequestration well enough to offer payments for its provision (Fassler, 2021; Fu, 2021). Critiques have also focused on the potential social ramifications of RA PES markets. Fassler (2021) and Mock (2021) both fear that payments will primarily be channeled to farmers who are already well connected and funded, and who tend to be white, male commodity-crop producers. In addition, some fear PES markets will incentive large-scale farmers to initiate "regenerative" practices on previously marginal land in order to access market payments. As marginal farmland is often wetlands or planted in perennial species, both themselves efficient carbon sinks, this could result in a net loss of sequestered carbon – while both farmers and large emitters take credit for addressing atmospheric carbon and climate change (Mock, 2021).

The roiling debate around RA, soil carbon sequestration potential and pitfalls, and payments for ES schemes for farmers has heavily focused on large scale rural farms on the order of 10,000 acres or more. Although it is a tax-funded grant program and not an

open-market exchange, the portion of the Portland Clean Energy Fund grant pool dedicated to RA can be considered as a form of urban agriculture specific payments for ecosystem services (Salzman et al., 2014), providing UA practitioners with funding to pursue carbon sequestration and other ES goals. Salzman et al. (2014) point to the obstacles that city governments face when trying to direct tax funds to ecosystem service projects, among them the clash in scales of most ecosystem service provision (regional, national, global) and most governmental bodies (local, municipal), the difficulty of determining who should pay for a public ecosystem resource or service, and the difficulty of accurately calculating the costs and benefits of providing and protecting ecosystem services, particularly over time. Given these challenges, PCEF is to-date a relatively unique program. However, some of the same concerns applied to large-scale RA PES markets could wind up applicable to PCEF as well. What organizations are deemed "UA" and therefore eligible for PCEF funding, for instance, will determine what communities and demographics receive the lion's share of available funding.

Urban agriculture has been under-researched in the RA literature (Kulak et al., 2013; Lal, 2014), but has a rich history of scholarly research exploring its many facets. How RA relates to four of the most prominently researched categories of UA will be discussed in the next section, with a particular focus on Portland's urban agricultural history.

RA, UA, and Scale

Although the potential environmental and economic benefits of RA are not proven to be linked to scale, most studies of regenerative agriculture's promises and impacts have

focused on large-scale, rural or peri-urban agricultural sites (Luján Soto et al., 2020; Skinner et al., 2019; Tautges et al., 2019). Urban farms tend to be far smaller: one study found the average urban agriculture site in Portland to be approximately an acre (McClintock & Simpson, 2014). In comparison, in 2019, the average overall farm size in Oregon was 425 acres (*Oregon Agricultural Statistics & Directory*, 2021), which itself is small compared to the average farm size in many other states, though very close to national average size of 444 acres (*Farms and Land in Farms 2019 Summary*, 2020). Many of the soil carbon building practices recommended by RA scholars and practitioners are intended for large scale implementation. Examples include grant programs geared towards encouraging commodity corn producers to transition acres of fallow land to a rotational cover crop system (*Cover Crop Program*, 2021), or training for grain producers to integrate livestock into production (Anderson, 2019), or the development of tractor implements that "crimp" finished crops to create a weed barrier instead of relying on tillage ("Organic No-Till," 2021). Small-scale, urban soil building practices may look different. In this research, I seek to add to research on urban-specific regenerative practices by illuminating what practices Portland's urban agricultural community members are already implementing.

Although individual urban farms may be small, that does not necessarily imply that their potential regenerative or ES benefits are small. Taken as a whole, a city's urban agricultural sites, along with other greenspace, may comprise many acres of land. McClintock et al.'s (2016) investigation of home gardening in Portland identified approximately 16 acres of urban space devoted solely to this one form of urban

agriculture. Another survey, by McClintock and Simpson (2014), heard from 27 urban agricultural organizations in Portland operating on an average of 1 acre of land each. Combined with other, under-surveyed forms of UA, this network of soil within the city could have the potential for notable ecosystem service provision or other benefits when RA practices are applied.

Understanding the breadth of urban agriculture space in Portland necessitates pinning down and operationalizing fuzzy lines between urban and rural, as well as assessing what forms of urban food and fiber production constitute "agriculture." In the following section I will discuss existing research defining urban agriculture, as well as the network of urban agricultural organizations operating in Portland today.

Urban Areas

Determining the exact edge of the "urban" is notoriously difficult, and particularly complicated in the case of urban agriculture, as many farmers market to urban customers while locating physically on the urban fringe to access affordable land (Beckett & Galt, 2014; Horst & Gwin, 2018). The definition of urban agriculture (UA) varies within the literature but most typically includes all forms of horticulture, aquaculture, livestock raising, and other varied agricultural pursuits taking place within the bounds of a city (Azunre, Amponsah, Peprah, Takyi, & Braimah, 2019; Kirkpatrick & Davison, 2018; Kulak, Graves, & Chatterton, 2013; McClintock et al., 2016; Thornbush, 2015). Peri-urban agriculture, or agricultural practice taking place on the outskirts of an urban area, is often but not always included within the frame of urban agriculture (Azunre et al., 2019). Studies into the limits and purposes of urban agriculture have established focuses such as

private gardening (Kirkpatrick & Davison, 2018; McClintock et al, 2016), community gardening (Aptekar & Myers, 2020; Eizenberg, 2012; Lawson, 2004), small-scale and direct market farming (Horst & Gwin, 2018), and "guerrilla gardening" or other "invisible" gardening ("FAO's role in Urban Agriculture," 2019).

Recent research into the many forms of UA has lauded its ability to better cities and society at large, from bolstering neighborhood-scale food security and economic development (Ghose & Pettygrove, 2014; Lawson, 2004; Vitiello & Wolf-Powers, 2014), to grand societal shifts in land use and the overall democratization of the global food regime (Azunre et al., 2019; Clinton et al., 2018). Food Policy Councils in major metropolitan areas have put forth UA-based solutions as part of city-wide food plans (Blay-Palmer, 2009; Coplen & Cuneo, 2015; McClintock et al., 2012). On an international scale, the Food and Agriculture Organization of the United Nations includes urban food production as a prominent arm of their Urban Food Actions Platform (*Food Production and Ecosystem Management*, n.d.). The Portland Clean Energy fund introduces a new form of funding for UA nonprofits in Portland and draws a direct connection between urban agriculture and its practitioners and the rising tide of interest in regenerative agriculture.

The broad umbrella of urban agriculture means that a wide variety of individuals and organizations could be categorized as urban agricultural practitioners. In the next section I will briefly discuss some emergent themes within the literature regarding urban agricultural practitioners: who they are, what form(s) of UA they practice, and why they engage in UA. These themes should not be considered representative of the entirety of urban agricultural practitioners – merely partially representative of groups and forms of

practice that have drawn attention from researchers. In addition, this paper focuses on UA in the USA and specifically in Portland, Oregon. Themes that I discuss here should be understood to be referring primarily to practitioners and research set in Portland and the greater United States, but certainly could and likely do reflect experiences of urban agriculturalists elsewhere as well.

Who Practices Urban Agriculture?

In this section I discuss four forms of urban agriculture that have received particular focus in UA research, including community gardening, urban farming, home gardening, and Indigenous-led urban agriculture. Although I discuss these forms of UA separately, it must be noted that they overlap significantly with each other and with other forms of UA practice not discussed here.

i. Community Gardening

Of the many forms of urban agriculture, community gardening has the longest and perhaps most thorough history of academic study (Bassett, 1981; Lawson, 2004; Okvat & Zautra, 2011; Saldivar-tanaka & Krasny, 2004). During economic downturns in the past two centuries, community gardens have been propagated as a form of neighborhood and social development within low-income and/or predominantly immigrant communities (Lawson, 2004). Research into community gardens and their participants has focused heavily on immigrant communities, such as the predominantly Latinx and Indigenous gardeners of South Central Farm in Los Angeles (Irazábal & Punja, 2009) and first and second generation immigrant gardeners in New York (Aptekar & Myers, 2020), as well as on the challenges and successes of community gardens in low-income communities

and majority Black communities (Aptekar & Myers, 2020; Bassett, 1981; Ghose & Pettygrove, 2014; Smith et al., 2013).

However, community gardening has also been investigated as a food-based counterculture movement more typically associated with white, affluent environmental activists, concerned with gardening space less for food security and more for recreational, moral, or health reasons (Aptekar & Myers, 2020). Who community gardening is considered to be "for" has ongoing land access and equity ramifications. Repeatedly, community gardens spearheaded by gardeners of color or in low-income neighborhoods have been bulldozed and developed in part due to the positive impact of gardens on surrounding property values, and the resulting wave of development interest and gentrification. Meanwhile, gardens led by white people or in upper-income neighborhoods are more likely to be able to advocate for permanent land access. (Aptekar & Myers, 2020; Crouch, 2012; Eizenberg, 2012; Ghose & Pettygrove, 2014; McClintock, 2014; Smith et al., 2013). In Portland, this trend can be seen in the history of the Green Fingers project, explored further in a following section (*Green Fingers*, 2021).

Although individual community gardeners are not eligible for PCEF funding, nonprofit community garden organizations are. Given PCEF's goal of prioritizing funding to communities of color and low-income communities, the inequitable history of community garden development and the potential for new greenspace to kick off gentrification in communities that have experienced disinvestment is important to bear in mind.

ii. Urban Farming

Urban farms, and the farmers who manage them, are often characterized as being justice-driven and more focused on community aims than food production (Dimitri & Rogus, 2014). Due to their small average acreage and less profit-driven mission, many urban farms do not meet the USDA definition of a "farm," which requires that a business or organization make more than $1000 in sales from agricultural products each year (*USDA ERS - Farm Structure*, n.d.). Recent literature on urban farming has focused particularly on food justice organizations. Many are mission-driven farms operating to address historical and systemic racism in communities of color via job training, fresh food provisioning, and community building. Authors have pointed to the potential for urban farm projects to exclude, minimize, and further marginalize prospective participants and consumers of color if the leadership of the farm is not reflective of the community (Ramírez, 2015; Reynolds, 2015) – something that PCEF seeks to address by channeling funds to organizations with leadership that is reflective of their home community. Urban farm leaders and workers reflecting the community served is of particular importance in predominantly Black communities, where the historical and ongoing traumatic ramifications of slavery must be acknowledged and given weight, lest historical power imbalances in labor practices be tacitly recreated (Bradley & Herrera, 2016; Ramírez, 2015).

The literature on BIPOC-led agricultural projects situates certain celebrated farms as "urban," including D-Town Farm in Detroit (White, 2011), Soul Fire Farm near Albany, New York (Penniman & Washington, 2018), Dig Deep Farms outside Oakland,

California (Bradley & Galt, 2014), and Planting Justice in Oakland (Wires & LaRose, 2019). However, D-Town is in a suburban community outside Detroit and Dig Deep operates in San Leandro, Cherryland, and Ashland - suburban communities outside Oakland. Soul Fire began as an urban agricultural dream and initiative in Albany but moved 30 minutes outside the city to access affordable land (Penniman & Washington, 2018). Urban land is expensive and sought after, and it is challenging for any farm to thrive in the heart of the urban core (Horst & Gwin, 2018). However, histories of redlining, segregation, and neighborhood disinvestment and destruction create additional financial, social, and systemic barriers for Black would-be urban farmers and other farmers of color (Bradley & Galt, 2014; Fassler, 2021; Gibson, 2007; Irazábal & Punja, 2009). Given these histories, it is perhaps unsurprising that the darlings of UA literature are often peri-urban or suburban, not strictly urban in location. It points to several considerations in who is considered an "urban" farmer, and what is considered an "urban farm" that have funding ramifications.

In the Portland area, many of the nonprofit farms that could be eligible for PCEF funds are led or crewed by Black farmers and farmers of color - Mudbone Grown (*Mudbone Grown - About Us*, n.d.), Black Futures Farm (*Black Futures Farm*, 2021), partners of Outgrowing Hunger (*Together, we're Outgrowing Hunger, 2021),* and Zenger Farm ("About," 2021) among them. The forces that push justice-driven farms, and particularly BIPOC-led farms, from the urban core are important to consider given that PCEF funding is only available to nonprofit organizations within the Portland city limits – nonprofit farms that may have historically operated within Portland but been forced to move due to financial pressures or racist action or policies, are not eligible for funding.

iii. Home Gardening

Home gardening may be the most prevalent form of UA. Home gardening has seen waves of participation similar and entwined with community gardens, such as the rise of Victory Gardens during World War II (Lawson, 2004) and again during the Covid-19 pandemic (Murphy, 2020). However, interest and prevalence do not necessarily make home gardening the most accessible form of UA. Although Gray et al. (2014) point to the inaccessibility of community gardening space as a driving factor behind the formation of La Mesa Verde, a home gardening support organization in San Jose, they also note that many Latino families that desired to participate but rented their homes ran into pushback from their landlords. Land ownership and land access are the means through which many potential or hopeful urban agriculturalists are barred or limited in their participation.

Although home gardeners themselves, like individual community gardeners, are not eligible for PCEF funding, home gardening is noted here both because it is a common UA access point for many urban residents, and because some Portland nonprofits – such as Growing Gardens (*HOME GARDENS – Growing Gardens*, n.d.) and the Equitable Giving Circle (*PLANTS + WELLNESS*, n.d.) that could be eligible for PCEF funding encourage UA through directly supporting home gardeners.

iv. Indigenous Urban Agriculture

Finally, Indigenous land care and food production methods in urban spaces hold an important place in the urban agricultural discourse. Many forms of Indigenous food production do not neatly overlay with settler images of urban farming or gardening, nor is agriculture a traditional cultural practice for many Indigenous communities. However,

Indigenous agriculture projects have surged, and seen an accompanying surge of research interest, in recent years, as Indigenous groups and leaders reclaim ancestral lands and build new pathways to food sovereignty (Croover-Payette, 2017; Rawal, 2020; Wires & LaRose, 2019. In UA specifically, the Native Gathering Garden in Portland will be used to cultivate food while also providing culturally specific gathering space (*Native Gathering Garden at Cully Park | The City of Portland, Oregon*, n.d.). Its mode of production is not the same as an urban farm or garden and may be unfamiliar to those without knowledge of medicinal and edible plants of the Pacific Northwest. Another example is Sogorea Te' Land Trust and the work of the Ohlone Confederated Villages of Lisjan Territory of Huchiun ("Contemporary Ohlone History," 2020). Sogorea Te' is an Indigenous and women-led trust that works to "rematriate," or return to its original Indigenous stewards, stolen land in what is now called Oakland. The Chochenyo-speaking Lisjan people have lived in reciprocity with the land for millennia and through Sogorea' Te seek to reclaim and ensure access to land for multiple purposes, including reclamation of foodways, language, and sacred practices (Wires & LaRose, 2019). Sogorea Te' currently stewards several sites - some of these spaces resemble settler conceptions of an urban farm or garden, but others do not.

These examples are of particular importance when discussing urban agriculture in Portland and PCEF grant funding. Grant funds or other funds that do not explicitly recognize and highlight Indigenous methods and spaces in their definition of RA and UA may render Indigenous groups ineligible for money and benefits. In the next section, I will discuss the study area of Portland, Oregon, as well as the existing boundaries and regulations of the Portland Clean Energy Fund. This question of the inclusivity of UA

and RA definitions, and who is invisibilized by them, will be returned to throughout the methods, results, and discussion sections.

Chapter Three: Study Area

Portland, Oregon

The land that is now called Portland, Oregon is the homeland of Kalapuyan, Chinookan, and Molalla tribes, who for centuries cultivated the fertile Willamette Valley and Columbia River watershed to produce foods for use and for trade, among them camas, acorns, salmon, and wapato (Lewis, 2018). Settlers sought to remove the Indigenous peoples from the Willamette Valley in part to gain control of valuable farmland (ibid.). This history is important to remember when considering that Portland is now often noted in UA research as a hub of urban agricultural initiatives and support (Coplen & Cuneo, 2015; Hatfield & Cohen, 2016; McClintock et al., 2016; Mendes et al., 2008).

The city as it exists today features both high citizen engagement in urban agriculture initiatives (McClintock et al., 2016) and institutional support via relatively lenient zoning codes and city and county level plans that acknowledge and support UA (*Climate Action Plan*, 2015; Martin et al., 2012; *Multnomah Food Action Plan: Grow and Thrive 2025*, 2010; *Urban Food Zoning Code Update*, 2011). Urban agriculture programs and organizations in Portland include over 50 city-managed community gardens (*Community Gardens | The City of Portland, Oregon*, 2020), over 80 school gardens (McClintock et al., 2016), nonprofit and for-profit urban farms ("About," 2021.; *Black Futures Farm*, 2020; T*he Side Yard Farm & Kitchen*, 2020), and institutionally sponsored farmer training programs ("Featured Program," 2020).

Portland's UA reputation is not perfectly rosy, however. Investigations into urban agricultural policies and endeavors within Portland have also focused on challenges for producers and consumers and shortcomings in equitable access to land and locally produced food. One example is the history of the Green Fingers community garden project (*Green Fingers*, 2021). In the late 1960s, the planned construction of Emanuel Hospital displaced hundreds of Black residents from the Albina neighborhood – the third in a series of major City projects that cleared Black Portlanders from Albina in the name of urban renewal and development. As the hospital construction faltered, a coalition of neighborhood groups, led by Viviane Barnett, formed the Green Fingers project to create community gardens on the vacant land. Green Fingers drew positive local and national attention, and at its peak served over 300 gardeners, many of them Black Portland residents with ties to the Albina neighborhood. However, despite its positive reputation, Green Fingers participants were steadily pushed from the space by the construction of the hospital, culminating in the bulldozing of all remaining gardens in June, 1978. Although the success of the Green Fingers project inspired the City to expand municipal community gardens, these gardens have been criticized as primarily serving white residents, while BIPOC residents are continually pushed out (Billings Jr., 2018).

In recent years, researchers have focused on urban agricultural engagement and exclusion in Portland at many scales. Coplen & Cuneo (2015) explored the collapse of the Portland Multnomah Food Policy Council, a body intended to advance equitable food policy in Portland that failed in part due to its over-representation of white and middle-class food system actors and exclusion of farmers, speakers of languages other than

English, and representatives of neighborhoods outside of the urban core. McClintock et al. (2016) found notable differences in home gardening engagement and land access among racial and socioeconomic groups within Portland, with white Portlanders having access to both more total and more centrally located home gardening space. And a survey of urban agricultural organizations found that 27% of Portland-based organizations had been hindered by governmental policies, and 52% of organizations had either somewhat or significantly modified their mission to access funding (McClintock & Simpson, 2014).

The Portland Clean Energy Fund and Urban and Regenerative Agriculture

As discussed, the Portland Clean Energy Fund (PCEF) introduces a new form of institutional funding for Portland's nonprofit urban agricultural organizations. PCEF defines applicable organizations as nonprofits registered with the state of Oregon, and applicable projects as those within the boundaries of the City of Portland (*Planning Grant Application Questions*, 2020). This definition is one that disqualifies certain groups of urban agriculturalists that may be employing regenerative practices, such as home gardeners or individual community gardeners, but opens eligibility to other groups that may be less recognized in the existing literature as forms of UA, such as Indigenous land care organizations and permaculture/food forest organizations.

Notably among Portland's UA initiatives, PCEF is explicit in directing funds to organizations led by, staffed by, and serving communities of color and low-income communities (*About PCEF*, n.d.). Priority is given to programs and projects that "both reduce greenhouse gases and promote social, economic and environmental benefits" for

low-income communities and communities of color (*Portland Clean Energy Community Benefits Initiative*, 2018).

Recognizing both the support for UA, and the ongoing challenges in its implementation in Portland, this research contributes to the literature on UA in Portland by assessing agricultural organizations' engagement in regenerative practices, awareness of institutional funding, and expressed need for financial or other support. In this literature review, I discussed the contentious debate over defining regenerative agriculture and delineating RA from previous agricultural movements, as well as the potential financial repercussions these debates have for farms and farmers via the concept of payments for ecosystem services and specifically cap and trade style payments for soil carbon sequestration. I discussed the existing means of measuring the impact of regenerative practices, with a particular focus on soil carbon testing. As RA has primarily been studied on large-scale urban farms, and the Portland Clean Energy Fund positions small-scale urban agricultural organizations as participating in RA, I outlined the parameters of what constitutes UA and what groups and demographics have received particular focus as UA practitioners. Finally, I briefly discussed the state of UA in Portland, Oregon specifically, and the organizations that PCEF seeks to prioritize for funding.

Chapter Four: Methods

In this section I discuss the research methods I employed. In addition to sections on participant selection, outreach, question creation, and coding and analysis, it is important that I begin with a note on my positionality as a researcher. All methods choices I made, the data I was able to gather, and the interpretation and results I reached from said data, stem from my personal background as a researcher and agricultural practitioner, with my own inherent biases, philosophies, and epistemological beliefs.

Positionality

My personal background and the connections that I have in the Portland UA field both supported and hindered my thesis research. I am a white woman and U.S. citizen from an upper-middle class background, raised in a predominately white and upper-middle class neighborhood of Portland, and educated in institutions with student bodies where the majority reflected my background. As a worker in the UA field in Portland for over five years, I worked for several organizations that sought to serve communities and students of color and/or low-income communities, but which were staffed by and led by entirely or majority white, middle to upper-middle class employees and boards. In the case of several workplaces, the organization leaned heavily on the volunteer (unpaid) labor of participants, often youth or students of color, while the participants on hiring boards – myself at times included - routinely selected white candidates for paid positions. In this research, I wanted to be explicitly aware of the frequent positioning of white UA participants as paid leaders and Black and Brown UA participants as unpaid "recipients" of UA missions, especially as PCEF funds are intended to benefit Black and Brown led

UA organizations, and could easily be diverted to white-led organizations with a savior mission and model. To pay attention to this dynamic required stepping beyond my connections with primarily white-led organizations and purposefully recruiting beyond my field of contacts to try to reach urban agriculturalists of color to avoid a whitewashed sample of Portland's agricultural practitioners. As I will discuss further in the results and discussions sections, I had mixed results.

I bring my own biases, assumptions, and beliefs about UA and RA into this research. I have undertaken previous research into permaculture and agroecosystems, and I have conflicted thoughts about these systems of agriculture, their shared Indigenous roots, and the predominately non-Indigenous practitioners who have profited from their expansion into the mainstream. My impressions and established ideas about permaculture and agroecosystems are relevant to the topic of RA, which shares common growing practices and a similar path into academia. Many of the practitioners of RA that I interviewed self-identify as permaculturalists or agroecologists as well.

My position as a researcher interviewing practitioners brings with it complicated power dynamics. At the time that I undertook this research, I was unable to offer financial incentive to interviewees for participating. By relying on the freely provided time and knowledge of participants, I recognize that I run the risk of repackaging the knowledge of individuals for an academic audience. This is a trend in academia that has disproportionately harmed communities of color and Indigenous communities. I recognize that my dual desires - to be respectful of this history, and to specifically recruit

urban agriculturalists of color and center their experiences – created tension and uncertainty for myself as a researcher, and potentially for my participants as well.

Finally, as I concluded the first draft of this thesis, I was hired as the Farm Manager for a new peri-urban agriculture project currently billing itself as regenerative in nature. As I continued to work on subsequent drafts of this thesis, my experiences attempting to employ practices such as cover cropping, solarization, drip and swale irrigation, and no-till on a new agricultural site, with limited staff and daylight hours, lent a new and powerful sympathy to my consideration of my participants' responses, which may be evident in how I interpret and discuss my results.

I include this Positionality section to encourage the reader to bear in mind myself as the researcher as an active and subjective force in the results and discussion that follow, and to invite feedback, critique, and ideas from other researchers with their own unique backgrounds and positionalities.

Participant Selection

Prospective organizations and individuals were identified through several methods. As a long-time participant in and employee of Portland UA organizations, I was able to use my own knowledge of and connections to the Portland UA community to identify potential interviewees. Next, I drew from the member organizations of the Oregon Community Food Systems Network (*Members*, n.d.). Finally, I employed snowball sampling techniques by asking interview participants to recommend potential alternate or additional organizations and individuals.

To narrow the potential pool of interviewees, I used PCEF eligibility as a flexible selection factor. Organizations that met all PCEF grant application eligibility requirements (i.e. registered nonprofit, operating within the Portland city limits, and prioritizing service to communities of color and low-income communities) were prioritized for outreach. However, I did not require that participants only suggest further prospective interview candidates that met all PCEF eligibility requirements. Therefore, some interviewees identified through snowball sampling, while still engaged in potentially regenerative urban agricultural work, would not be eligible for PCEF funding.

Outreach and Participant Recruitment

Between March 1st, 2021, and March 14th, 2021, I contacted 20 organizations to request an interview. The recruitment email that I used is included in Appendix II. I reached out to prospective organizations a second time if I received no response after ten days. Of the twenty initial prospective organizations, nine agreed, three declined, and eight did not respond to outreach. I recruited participants from two additional organizations via snowball sampling.

From these eleven participating organizations, I interviewed thirteen total participants – two interviews had two participants. Participants primarily represented nonprofits given my recruitment parameters, but also included one for-profit farm and three staff members of higher-education institutions eligible for PCEF funding via a non-profit foundation arm of the institution. Interviewees held a variety of different positions within their organizations. Interviewee roles and duration of involvement in their organizations are summarized in the following table:

Table 3: Participant's Organizational Role and Duration.

Participant Role	**Number of Participants**
Farm/Garden Manager	5
Executive Director	4
Staff Member	3
Volunteer	1
Employment	**Number of Participants**
Full-Time	8
Part-Time	5
Years in Position	**Number of Participants**
0-2	6
3-5	5
>5	2

Collecting demographic data was not the focus of my interviews, however topics of race, gender, and immigration status were present throughout the interviews. My participants skewed white but included two Black and two Latinx agriculturalists. Three participants self-identified as immigrants, and, when stated, gender was relatively evenly split between male and female. These demographics are not included in order to run any quantitative analysis of responses by race, gender identity, or immigration status, but to present a single data point in the landscape of literature on Portland's urban agricultural practitioners, and to contribute some small data to the growing body of literature investigating the racialized workforce dynamics of urban agriculture and food justice (Bradley & Herrera, 2016; Coplen & Cuneo, 2015; Fassler, 2021.

I interviewed candidates between March 11th, 2021, and April 6th, 2021. Interviews took place predominantly remotely over Zoom or phone call due to the Portland State University COVID-19 research requirements. Interviewees were asked for at most one hour of their time; final interviews ranged from 28 minutes to one hour and fifteen minutes.

Interview Questions

Interviews focused on participant's knowledge of regenerative agriculture, their experience with regenerative practices, the impacts they have seen or expect to see from regenerative practices, and any metrics they or their organization have used to measure the impact of their regenerative practices. Interview questions are included in Appendix I.

I used the term regenerative agriculture throughout interviews and throughout my results sections because it is the term I am focused on in this research, and because it is a

term that PCEF eligible organizations may share familiarity with. However, I asked interview participants if there is another term that they use or associate with soil-building agricultural production. This research seeks in part to clarify overlap and differences between terms such as RA, organic agriculture, sustainable agriculture, permaculture, and agroecology, at least as understood and practiced by Portland's urban agriculturalists.

In addition, I asked participants how they or their organization would use PCEF funding or other large-scale support to further their regenerative agricultural aims. Interview questions were flexible in nature – although I began each interview from the same base set of questions, the natural flow of the conversation with each participant varied. Thus, certain interviews focused more on certain subtopics than others. However, I focused on my three specific research questions in each interview, rephrased for interview purposes as:

- How do you define regenerative agriculture?
- What practices of regenerative agriculture do you/does your organization currently employ?
- How do you/does your organization measure regeneration in your agricultural projects?

With spoken interviewee consent, I recorded interviews for transcription using Zoom's built-in recording feature. Certain interviews took place over the phone and were not able to be recorded – for these I took notes during the interview and captured key elements immediately following the interview. Transcription was undertaken using Otter.ai and checked against interview recordings for accuracy.

Coding and Analysis

Due to the small total number of participants, I coded manually using printed interview transcripts. Interviews were coded thematically using a hybrid approach. I developed a list of a priori codes using my knowledge of the subject matter, interview themes, and research goals. During the initial coding process, I relied on my initial codebook while also inductively coding for emergent themes. I used successive rounds of memo writing and coding to explore and refine both a priori and emergent codes, establishing four main themes as well as subthemes. In addition, I collected basic quantitative data on numbers of participants employing which regenerative practices, which methods of data collection, etc. Results, as well as discussion and limitations, will be covered in the next section.

Chapter Five: Results

In this section I discuss the results of my interviews, divided into four main themes. First, I discuss findings on participants' definitions of and beliefs about RA, as well as preferred (and less preferred) terms to describe soil building agricultural practice. I discuss the metrics participant organizations employ to measure impact, as well as participant beliefs about the utility and accessibility of soil carbon testing specifically. Metrics are closely tied to opportunities for institutional funding – participant organization's reliance and beliefs about institutional funding and support for UA is a third theme. Finally, I discuss participant beliefs about the relationship between urban agriculture and regenerative agriculture, as well as emergent urban-specific facets of regenerative agriculture. Throughout, I refer to participant responses and basic quantitative data found in Table 4.

Unless specifically noted, perspectives on and definitions of RA shared throughout this thesis should be considered the view of the participant, not the organization they represent or for which they work. Practices and metrics used can be interpreted as organizational, not individual. Interview participants shared at times critical views of institutional funding streams and the concept of regenerative agriculture, while also representing organizations that had applied for or received PCEF funding. Because of the potential, however minute, for financial repercussions, neither participants nor organizations will be identified by name.

Table 4: Results.

RA Practice	**Number of Respondents Practicing**
No-Till	10
Biodiversity Encouragement	10
Composting	9
Diversified Crop Production	7
Cover Cropping	6
No Spray	6
Hand-Scale Practices	6
Youth Education	6
Perennial Production	6
Drip Irrigation	5
Mulching	4
"Doing Less"	3
Listening	2
Tasting Soil	2
Solarization	2
Microbial/Fungal Focus	2
Swale Irrigation	1
Organic Seed Use	1
Companion Planting	1
Seed Saving	1
Livestock Integration	1
Metric of RA Impact	**Number of Respondents Employing**
Interest in Future Soil Carbon Testing	*6*
Pounds of Food Produced	5
Soil Organic Matter Testing	4
Site Photos	4

Soil Color	3
Number of People Served	2
Pounds of Compost Created	2
Volunteer Hours	2
Visual Assessment of Soil Fungi	2
Species Count	1
Pest Pressure Decreases	1
Labor Hour Decreases	1
Participant Surveys	1
Portland Clean Energy Fund Participation	**Number of Respondents**
Aware of PCEF Funding	10
PCEF Grant Applicant	7
PCEF Grant Recipient	5
Funding Priority	**Number of Respondents**
Staffing	7
Community Education	4
DEI Initiatives	4
Clean Energy Infrastructure	2
Outreach/Program Expansion	2
Composting Infrastructure	1
Perennial Planting	1
Cross-Organization Collaboration	1
Prefer Not to Say	1

Is Anyone Practicing Regenerative Agriculture?

Participants were asked their personal definition of RA. Although definitions did vary, a personal definition that captured many of the elements shared across respondents is:

> "What would be considered organic best practices using on-site inputs as much as possible, but then also considering the full life cycle of the [site], including transportation, and a huge chunk also being the social component – regenerative agriculture [needs] to concern the human, emotional, social, and economic elements."

To me, my most interesting finding is that very few participants – even those advertising their organization as practicing RA - felt a strong connection or alignment to the specific term "regenerative agriculture." Only two identified RA as the best or most accurate term for their agricultural beliefs and/or practices. Notably, one of those participants was part of one of my two person interviews, and their organization partner disagreed, offering "partnership [with the land]" as a preferred term to RA. Four of the participant organizations have public-facing information that specifically includes the terms "regenerative" and "regenerative agriculture" – when asked, these participants all expressed discomfort with the term RA and shared alternate terms they preferred.

When asked what term(s) or phrase(s) they preferred to describe "regenerative" agriculture or practices, participants offered a variety of words and phrases, some unique and many overlapping. Among the most common were "Indigenous practices," "resilience," and "closed loop." Other terms that participants offered included "balanced farming," "sustainable," "partnering [with the land]," "ecologically grown," and "humble/humility."

An alternate term or phrase used by many participants that requires deeper analysis is permaculture. Of thirteen total participants, four participants named permaculture and permaculture practices as akin to but more positively impactful than the practices they associated with RA. However, a separate three participants noted similarities to permaculture but expressed doubts and critiques about permaculture and the permaculture movement, positioning regenerative agriculture as a preferable or more inclusive term than permaculture. Said one participant:

> "I don't like using [permaculture]. Because permaculture […] has become very cultlike, in some ways, and very whitewashed, and like, all the principles being attributed to […] white men in the [19]60s."

This split among participants on whether permaculture is synonymous to, better than, or worse than regenerative agriculture as a term hinges on many of the differences discussed in this research comparing permaculture and RA; their disparate yet similar histories, the demographics of their advocates, and the aims of their movements.

Several participants described their skepticism towards the term RA in relation to other agricultural movements. Participants likened RA as a term to "organic," and "sustainable," words which they described as once holding specific meaning regarding agricultural practice but becoming corporate or institutional buzzwords over time. "It's that shiny penny phenomenon, the new sexy thing" said one. "Regenerative agriculture is a much newer term […] we were talking about cover crops like fifteen years ago," said another. Participants who are also PCEF recipients recognized that RA is the term of the day receiving institutional funding and were willing to use it to access said funding, but did not feel that it fully or accurately captured their practices or values.

The majority spoke critically of the adoption of the term RA by predominantly white-led settler organizations. They described the underlying philosophies and methods as based on Indigenous growing practices, as well as on practices adopted by Black farmers in the United State in response to institutional barriers to funding and support. Said one participant:

> "Regenerative agriculture is not a new concept, right? [But], you know, we're putting a new spin on it. And so […] I don't want this to be whitewashed. I don't want this to be all of a sudden, like, "cool, Portland's doing regenerative agriculture, yes, finally!" [G]o talk to some Indigenous Mayan farmers, go talk to Indigenous Hawaiian farmers, like, go talk to the Japanese farmers who've been doing this for generations, and have the concept down. We're not inventing something new. We're trying to understand it."

One participant took this discomfort with the term RA farther, positioning RA and the regenerative agriculture movement as obfuscating legacies of colonialism and deflecting from the true depth of behavior change needed to achieve beneficial results:

> "I think there are a lot of technical or practical approaches to regenerative agriculture, but the key for me has to do with the fact that we need to do that to begin with. [It's] really important to recontextualize that, because I don't think we have any idea what we're even trying to get back to when we say regenerative. Regenerate to what?...In my opinion, we have to create anew. Because the inhabitants who were here that made those cultures possible are gone today. There aren't, you know, 70 million or 120 million, pick your number, bison roaming the open plains anymore, there aren't flocks of birds that can darken the sky for days, right? [So] that's what I think about when I think of regenerative agriculture. I don't think it's actually a thing that can happen. I think just like the people before us we have the capacity to create culture. It's gonna be a lot more complicated these days. But at least speaking about the task at hand honestly…if we can't talk about it, how are we gonna do it?"

For many participants, including the participant quoted above, the practices they employed and their connection to agriculture was deeply personal. Participants named family members and mentors as instrumental in bringing them to urban agriculture, shared personal emotional, spiritual, and physical connections to the land on which they

worked, and spoke of the philosophical underpinnings of their practices. Many shared an agricultural philosophy that I have tentatively deemed for the purposes of this research "human/ecosystem connection," recognizing the holistic aims and impacts of their practices as beneficial for soil, plant, and animal biodiversity, as well as for human communities and their own personal development. Those who expressed their personal reflections on human/ecosystem connections shared some common themes, namely:

- A recognition of pests, weeds, and other agricultural challenges as elements of an ecosystem at work, not enemies,
- The agricultural benefit of human inputs of time, thought, and creativity,
- A desire to work at a smaller scale, minimizing mechanical and chemical inputs, and
- A personal fulfillment stemming from agricultural work.

Given this focus on holistic human/ecosystem connections, it is perhaps unsurprising that very few participants saw soil carbon sequestration as the be-all-end-all of their personal or organizational aims and impacts. Participants expressed doubts and confusion around the reasoning behind soil carbon sequestration as a metric of RA success, as well as around the utility and accessibility of existing soil carbon testing. These findings, as well as metrics employed by participant organizations to measure impact, are discussed in the next section.

Soil Carbon Testing: A Worthwhile Investment?

Table 5: Metrics Employed by Participant Organizations.

Metric of RA Impact	**Number of Participants**
Interest in future soil carbon testing	*6*
Pounds of food produced	5
Soil organic matter testing	4
Site photos	4
Soil color	3
Number of people served	2
Pounds of compost created	2
Volunteer hours	2
Visual assessment of soil fungi	2
Species count	1
Pest pressure decreases	1

Labor hours decreases	1
Participant surveys	1

Participants were asked what, if any, metrics they used to measure their "regenerative" impact. Results are shown in Table 5.

No one metric was employed by even half of my participants. The most commonly employed metrics were pounds of food produced, soil organic matter testing, and site photos. Other metrics participants named include qualitative measures such as the color of the soil, the presence of soil fungi, impressions of reduced pest pressures over time, and impressions of reduced labor hours over time. Quantitative metrics used by participants included species count of animals on site, number of organizational participants served, participant survey results, volunteer hours, and pounds of compost produced on site.

Participants were asked if they had performed any tests to measure the soil carbon sequestration potential or impact of their practices. If they had not, participants were asked if they would be interested in soil carbon testing for their site. Six participants expressed interest in soil carbon testing but were uncertain how to access testing. However, no participant believed they had successfully undertaken any such testing.

Four participants had done testing to determine the organic matter content of their soil. Participants were not asked to specify which soil organic matter test(s) they had

undertaken, however given the accessibility constraints of the Walkley-Black and dry combustion tests (Sullivan et. al., 2019), it is most likely these participants used the Loss on Ignition (LOI) test.

Notably, two participants who had used SOM testing in the past expressed interest in soil carbon testing, and confusion over the similarities and differences between SOM and SOC testing. SOM is not directly measurable, and therefore SOM and SOC are measured using the same three major tests (Sullivan et al., 2019). The general uncertainty among my participants regarding what constitutes soil carbon testing is reflective of broader practitioner uncertainty in the literature (Johns, 2017; Welsch et al., 2019).

Participants expressed concern over the cost of the testing, the accuracy of the results, and confusion over how to access the necessary materials and equipment for testing. Some participants expressed deeper doubts about the outcome of relying on soil carbon testing as a means of measuring regenerative impact. Participants raised concerns that soil carbon testing would not capture the whole story of sequestration potential, that testing was a means of accessing funding but not a useful agricultural tool, and that regardless of the outcome, utilizing soil carbon sequestration as a measure of success for regenerative work on small urban lots was not an achievable metric of success. Said one participant, "I just don't believe that that can break even on an urban scale. I just don't think urban agriculture can capture as much carbon as is released even taking the bus to and from the gardens." This final concern will be discussed in more depth in the final section on UA specific features of RA.

Four of the participants who had either applied for or received PCEF funds expressed a plan to pursue future soil carbon testing specifically because it is a metric of success suggested by PCEF. By undertaking soil carbon testing, the participants may align themselves with the potential for greater future funding. This approach to data collection and utilization to access institutional funding, as well as the complex emotions and beliefs that participants discussed in relation to institutional funding for regenerative agriculture, will be discussed in the next section.

PCEF, Funding, and the "Tenuous Relationship"

Table 6: PCEF Awareness and Funding Priorities.

PCEF Participation	**Number of Participants**
Aware of PCEF funding	10
Organization had applied for funding	7
Organization recommended for funding	5
Funding Priority	**Number of Participants**
Staffing	7
Community Education	4
DEI Initiatives	4

Clean Energy Infrastructure	2
Outreach/program expansion	2
Composting infrastructure	1
Perennial planting	1
Cross-organizational collaboration	1
Prefer not to say	1

Of the participants, a majority were aware of PCEF and PCEF funding for regenerative agriculture projects. Seven had applied or partnered on an application, and five had been recommended for funding at the time of our interview. These results are shown in Table 6. All participants, regardless of whether they had applied for or received PCEF funding, were asked what they would do with PCEF funds or another large funding opportunity. Answers are in Table 4. By far the most common answer was increased funding to staffing and new position creation – ten participants noted increased staff capacity as a high priority for funding. Four participants named educational programming as a high priority for PCEF or other funding, and four participants named DEI work as a high priority for funding. For some participants, these three funding goals were

inextricably linked, i.e. funding paid staff representative of PCEF's target communities to provide community education.

Other priorities named by participants included infrastructure improvements, for composting and clean energy provision, as well as outreach and program expansion, perennial planting and maintenance, and cross organizational collaboration.

Many participants expressed doubts that PCEF would be able to provide stable funding for staffing and program expansion. Said one participant, "It'd be awesome if something like that could actually provide a secure source of funding, but usually grants don't do that. Usually grants are not about funding people's positions."

Almost all participants represented nonprofit or nonprofit-affiliated agricultural organizations operating within the Portland city limits. Of these participants, many expressed excitement at the possibility of grant funding via PCEF, but many also expressed doubts and frustrations related to their organization's nonprofit status and reliance on larger institutions for funding. One participant summed up the feelings of many, describing their organization's reliance on the state of Oregon and other large-scale institutions for funding and land access as a "tenuous relationship." Other examples of "tenuous relationships" that participants relied on for operation include:

- Short term leases on land (typically one to three years) that may or may not be renewed in future years,
- Supportive regulations and policies of the city of Portland and other institutional funders and partners,

- Engagement and interest by officials in charge of educational facilities and state facilities to renew contracts for programming, and,
- Continued prioritization and funding from larger umbrella organizations regarding land and staffing. One participant, who manages an educational garden within a broader institutional structure, described this form of relationship as: "[educational institutions] have a strong tendency to build and […] reconstruct their physical spaces, and not necessarily prioritize "undeveloped" land."

Reliance on the good will and supportive regulations of larger institutions impacts which practices organizations are able to employ. A participant representing an organization that contracts with public schools to do garden development and education work spoke about the disparity between the composting practices they would like to engage in and the regulations from the public school district:

> "I wish that there was a bigger commitment to keeping all of that on site and recycling all the nutrients back into the garden. We really don't have a great set-up for composting at our sites […] and sometimes schools or districts are just like, "ew, no, please don't have these piles." [And] a lot of our schools […] don't even have green bins that we can put things into. Everything literally goes into a dumpster."

The tenuous relationships that shape participant organizations' engagement in "regenerative" practices also impacted interviewee's thoughts and beliefs regarding the specific potential for and shortcomings of practicing RA in urban spaces. These beliefs will be discussed in the next and final Results section.

UA, RA, and the Question of Scale

Table 7: Regenerative Practices Used by Participant Organizations.

RA Practice	**Number of Participants**
No-Till	10
Biodiversity encouragement	10
Composting	9
Diversified crop production	7
Cover cropping	6
No-spray	6
Hand-scale practices	6
Youth education	6
Perennial production	6
Drip irrigation	5
“Doing less”	3

Listening	2
Livestock integration	1

In line with my research question on the practices associated with regenerative agriculture currently employed by Portland's urban agricultural organizations, participants were asked what practices their organization employs that they consider "regenerative" in nature. Participants named a variety of practices that they consider regenerative, as shown in Table 7. Participants and their organizations may use other practices than those named but not have mentioned them during our interview, therefore practices listed here should not be taken as reflective of the totality of RA practices employed by participating organizations.

In line with broader research on RA practices, no-till and low-till was one of the most frequently named practices that participants considered regenerative. Ten out of thirteen participants described their organization as employing no-till or low-till growing practices. Participants described using no-till and low-till practices to maintain existing soil carbon stores and soil structure, to preserve soil biodiversity, and to reduce the use of machinery on agricultural sites. However, the no-till methods employed by my participants are distinct from those employed by large-scale, mechanized "RA" farms – none of my participants or their organizations use a tractor powered roller-crimper ("Organic No-Till," 2021), for instance, to avoid tillage. Instead, small-scale, urban no-till methods used by my participants included the use of cardboard and other opaque

material to smother weeds (sheet mulching), solarization using black plastic, and hand-scale weed removal and soil preparation.

Notably, one participant expressed some doubt about no-till practices, particularly in urban agricultural settings, stating:

> "To me the jury's still out, because with no-till the weed management regimen is totally different and there's a lot more early season soil preparation. Half the reason we till is so the soil can dry out – if you don't open it up the additional surface area takes forever for [our] clay soils to be dry enough to plant in. Of course, if you've been building the soil for ten years and you've got a really thick layer of high organic content, then that takes care of itself, but I feel like there's a real hill to get over in terms of building up the organic content enough that you don't have to till, so you keep having to till, which keeps destroying your organic content."

The time investment necessary for no-till practices to be most effective was noted by other participants as well. One participant described their site as taking four years in a no-till management plan for the soil to be easily workable for planting in the spring. For those participants whose access to urban land is based on a "tenuous relationship" with a larger institution or organization, this time commitment may be less feasible.

The encouragement of biodiversity was the other practice named by most participants. However, "biodiversity encouragement," while a theoretical practice in and of itself, can be achieved via many of the other practices named by a smaller number of participants, such as not applying chemical pesticides or herbicides, mixed crop production, and hand-scale/no-till practices. The encouragement of microbial and fungal biodiversity is separated from broader biodiversity encouragement because it was specifically named by two participants as a purposeful and active practice that they see as reflective of their goals.

Other practices named included composting, youth education programming, perennial crop production, cover cropping, drip irrigation and swale irrigation, organic seed purchase and seed saving, mulching, companion planting, solarization, listening to the land, tasting soil, and the integration of livestock. Although these practices were named by a smaller percentage of participants, that should not be taken to indicate that they are less regenerative in nature. For some participants, practices such as listening, solarization or mulching were central to their understanding and beliefs about regenerative agriculture, though named by fewer participants in total.

These practices fall in line with existing research on regenerative practices (Fassler, 2021; Newton et al., 2020; *Regenerative Organic Agriculture and Climate Change*, 2014). However, notably only one participant mentioned livestock integration as a regenerative practice they employ. According to some researchers, the integration of livestock is so critical to RA's purpose and promise that agricultural sites operating without integrated livestock cannot hope to achieve the same impacts as those with thoughtfully integrated livestock (Anderson, 2019; Kane, 2015).

Livestock integration is one practice that is not achievable for many of my participants due to their urban siting and small scale. Because of this and the other limitations of their organizational scale, participants expressed doubts about the reality of achieving broad RA goals – most notably soil carbon sequestration - in urban locations. Said one, "I've never billed us as a regenerative agriculture garden […] we're so small scale." Said another, "the scale isn't there."

However, participants also reflected on benefits and impacts that they saw as uniquely urban-specific – many related to education and community building. One participant, when discussing their organization's focus on youth education, described the benefit of showcasing "regenerative" practices in an urban setting as, "when you have care for a small space, the context for protecting larger places is in place." By teaching urban youth the practices of soil building, composting, and perennial planting, they hoped to build an understanding of these practices on a larger national or international scale.

Another participant (the only one to mention integrating livestock) described their site as employing the same practices as larger scale regenerative farms, but with a different set of goals:

> "I'm on a small-scale site, we practice agriculture that has soil building elements, but not building inches of soil – the focus is more on biodiversity."

The doubts that participants expressed about RA – about its origins as a term, the realism of its carbon sequestration claims, and its relationship to their own UA organizations and practices – present an interesting set of discussion questions, particularly as many of the organizations my participants represented are reliant on proving that they are employing regenerative practices and reaping regenerative benefits in order to access PCEF funding. In the following discussion section, I will cover how my results relate to the existing literature on RA promises and critiques, as well as offer suggestions for further research and for policy and action to incorporate Portland's UA community's beliefs and expressed needs into future funding.

Chapter Six: Discussion

My findings align with and support existing research into the practices most readily associated with RA. Of the organizational practices participants named as regenerative in nature, the majority are represented in Newton et al.'s (2020) survey of commonly named regenerative processes. Four practices named by participants – youth education, drip irrigation, microbial/fungal focus, and tasting soil – are not directly named by Newton et al. However, drip irrigation, tasting soil, and microbial/fungal focus could all be considered elements of some of the broader processes named by Newton et al., such as using local knowledge, using ecological principles, and maximizing on-farm inputs. Youth education was named as a practice by some of my participants but finds its closest overlap in one of Newton et al.'s regenerative outcomes, namely improving the social and/or economic wellbeing of communities.

My findings also align with critiques of RA as the best or truest term for said practices and outcomes. As others have expressed (Fassler, 2021; Penniman & Washington, 2018; "The Leaders Who Founded the Organic Movement," 2021), my participants noted the Indigenous history of many practices now deemed regenerative, as well as the long term use of similar practices by Black agriculturalists, and feared that the rise of RA as a buzzword and lightning rod for funding would further obfuscate the true roots of these practices and direct funds to white, settler farms and organizations already in positions of power.

Researchers have pointed to the inaccessibility of soil carbon/organic matter testing to farmers – this inaccessibility is supported by my finding that only four participant

organizations had utilized soil organic matter testing, and none felt confident that any available test would accurately measure their soil's carbon sequestration ability. My findings contribute to a growing wave of critiques of soil carbon testing as a valuable metric of agricultural lands' ability to mitigate climate change (Fassler, 2021; Tautges et al., 2019). In addition, participants shared specific doubts about soil carbon testing as a useful means for specifically urban agricultural sites to measure their regenerative impact, noting that the small size and instability of land access means many UA sites may not be capable of meaningfully sequestering carbon.

However, these doubts about UA's ability to mitigate climate change through soil carbon sequestration were not doubts about UA's overall value to ecosystem service provision, community support, or climate change mitigation. Participants identified a suite of positive impacts and services stemming from UA, ranging from habitat provision for biodiversity to youth education. Said one participant, "how can it be regenerative if children are not involved?" Many participants saw a large part of their "regenerative" impact as the educational value that they brought to urban communities, and especially to youth. Others discussed how increased food provision within urban areas leads to a decrease of vehicle miles traveled for food, or how planting perennials supports carbon sequestration through herbaceous growth. That soil carbon sequestration may not be an ideal metric for urban agricultural benefits does not mean UA is without benefits.

Even those participants who outwardly described their organizational work as "regenerative agriculture" expressed discomfort with that term. Although participants were willing to accept RA as a way of describing their agricultural beliefs and practices,

very few found it a preferred term. There was no one term or concept that most participants presented as a better or more accurate alternative. Permaculture was certainly the most divisive alternative term or concept, having a nearly even split between proponents and critics. Although each participant presented their own unique way of describing their agricultural practice, the methods and practices used across all participants shared great overlap. Even if participants would not describe what they are doing as "regenerative agriculture," they are employing similar practices drawn from a similar playbook.

That no-till agriculture was the most commonly cited practice by participants aligns with existing research heralding no-till as critical to RA aims (Anderson, 2019; Newton et al., 2020; Zhang et al., 2018). However, it is important to note that the no-till practices employed by the participants in this research differ greatly from those used by large-scale farms, which tend to be highly mechanized ("Organic No-Till," 2021). The no-till practices used by my interviewees and their organizations were predominately hand-scale, relying on manual labor, time, and simple tools such as thick plastic and cardboard to prepare untilled beds for new crops. In this way, although the "regenerative" practices used by urban agriculturalists and large-scale rural farmers may at times be the same on paper, on the ground they may be very different.

The practices employed by participant organizations could be described as ecosystem service provision, and many of the practices and metrics that interviewees described fall in line with ecosystem services as described by the MEA – food provisioning through crop production, resilience through encouragement of biodiversity, oxygen production

via perennial growth, etc. (Millennium Ecosystem Assessment, 2005). However, the relationships participants themselves expressed to their agricultural practices and to the land on which they work do not fit neatly into an "ecosystem services" framework. Participants viewed themselves as part of the ecosystem in which they worked, providing and receiving "service" in equal measure, in a messy web of relationships that can not necessarily be neatly measured and reported to a grant committee.

However, participants did try to delineate their practices and impacts to access funding and ongoing stability. It is notable to me that only one participant described their organization's access to land as truly "stable" – most described their land access as reliant on ongoing funding, the renewal of short-term leases, and the ongoing goodwill of institutional actors in many "tenuous relationships." The carbon sequestration goals of RA are built upon an assumption that agricultural land will remain agricultural, at least for the foreseeable future – for urban agriculturalists, and particularly those affiliated with non-profit organizations, stability of land access to continue agricultural work is far from assumed.

In line with the findings of McClintock & Simpson (2014), most participants expressed excitement at the prospect of PCEF funds to support their work. Interviewees both celebrated the launch of PCEF and struggled with the disconnect between the typical requirements of grant funding and their own pressing organizational needs, primarily staffing. In the next section, I will cover limitations of this research, as well as recommendations for future research and for policy and action.

Chapter Seven: Limitations, Recommendations, and Conclusion

Limitations

This research has several limitations that must be acknowledged, and that could be addressed through future research with the Portland UA community.

The largest limitation is the small sample size of this study. The Portland UA community is large, and there are many additional organizations and individuals that I was unable to reach for an interview, or unaware of as potential interviewees. As addressed in my positionality statement, my own identity and the pre-existing connections that I have to a number of Portland UA nonprofits both helped me acquire willing interviewees who already had some familiarity with me, and likely dissuaded other potential interviewees from participating. My inability to offer financial incentive also discouraged broader participation and more representative participation.

An additional limitation that impacted my participant recruitment was the timing of my outreach. I reached out to potential participants during the month of March, a month that typically is the kickoff for seasonal agricultural tasks. Future research with the Portland UA community could address this limitation by scheduling outreach and data collection during the winter months, something I was unable to do during my data collection timeframe.

It is impossible to write about research limitations in the year 2021 without discussing the impact of COVID-19 on my data collection and results. The disruptions caused by the onset of the pandemic pushed my research timeline back by six months as I worked to adapt my thesis plan to the new university research requirements and the

challenges of pursuing research in a newly distanced, online format. A major change from my initial research plan is that interviews took place over Zoom and the phone to comply with ongoing COVID-19 distancing requirements that blocked in-person research. I had intended to visit participants at their organization's farm or office and complete interviews in person – in future research with Portland's UA community, I believe that in-person data collection would strengthen both the number and diversity of interview participants.

Almost all interviewees mentioned the ways in which COVID-19 had impacted their organizations and work in the past year – differing but overlapping impacts that included increased community demand for fresh food, decreased funding and staffing, and participants' inability to access organizational garden spaces. COVID-19's health, social, and economic impacts are far from race-neutral, and those organizations that may have had the least capacity to engage in unpaid research activities overlap significantly with those most negatively impacted by COVID-19, an example being organizations focused on Oregon's Hispanic and Latinx farmworker communities (*PCUN | Oregon Worker Relief Fund*, 2021).

Further research into the actual impacts of regenerative practices by Portland-area urban agricultural organizations over time, such as ongoing on-site species sampling for biodiversity or tracking pounds of food produced, would add weight to this initial research. In addition, research comparing the impacts of PCEF funding on recipient organizations over time as compared to organizations outside of the Portland city limits

would be useful in determining the impact of PCEF funding on the implementation of regenerative practices.

Thus, further research investigating the beliefs and practices of Portland UA community could build upon the results expressed here by 1) offering financial recompense, 2) offering greater flexibility in interview location, 3) interviewing candidates during the winter, and 4) undertaking research over a longer time frame to build trust between researcher and participant(s) and measure impacts over time.

Recommendations for Future Action and Policy

Some of my recommendations for future action and/or policy related to Portland's urban agricultural community and RA are drawn directly from the expressed desires of interview participants. These are:

- Greater collaboration between urban agricultural organizations, including opportunities to share resources and research, and to collaborate on ways to strengthen regenerative impacts across the city's agricultural land as a whole. One possible means to accomplish this within the framework of the Portland Clean Energy Fund would be a cross-organizational Planning grant application focused on funding shared research and development.
- Multi-year funding focused specifically on permanent staff positions.
- Free or low-cost soil carbon testing opportunities for urban agricultural organizations provided by Portland's higher education institutions. Portland State University's Environmental Science and Management

department could be a great resource for urban agricultural soil carbon testing.

Although I do recommend the expansion and improved accessibility of soil carbon testing, it is not my recommendation that the results of these tests be used as a means of measuring urban agricultural organization's regenerative impacts. Instead, soil carbon/soil organic matter testing can provide valuable information to agriculturalists regarding the health of their soil and the impacts of soil building efforts over time.

The Portland Clean Energy Fund is an exciting and, as of this writing in 2021, unique opportunity for large scale funding for Portland's urban agricultural organizations. Although my sample size is small, it is notable that five of my participants represent organizations that are recipients of PCEF funds in the inaugural round of funding, and none of the participants I interviewed from those organizations expressed a strong connection to the term "regenerative agriculture," nor a strong belief that their efforts will result in notable soil carbon sequestration. It is my recommendation that rather than writing urban agriculture off as not meeting the climate change mitigation goals of PCEF, that PCEF or other large funding sources recognize the benefits that urban agriculture does offer, and the metrics that are already being used by organizations to showcase their impacts. Regenerative agriculture is enjoying a heyday as a buzzword – the new shiny penny – right now. Will funding for the expansion of UA jobs, composting infrastructure, perennial crop planting, and community outreach and education still exist when RA's star fades, like organic and sustainable before it?

One opportunity that I see to avoid the rise and fall of funding along with the rise and fall of the term RA would be for PCEF and other funding opportunities to explicitly recognize and highlight the Indigenous roots of many practices currently associated with regenerative agriculture. By highlighting Indigenous land care practices as valid forms of climate change mitigation worthy of funding, the Portland Clean Energy Fund or other funding programs could streamline the funding of Indigenous led organizations – something that is already front and center in PCEF's mission – while adopting language that points to the true history of many agricultural practices and thus step off of the buzzword treadmill.

Conclusion

This research contributes to the ongoing investigation of regenerative agriculture as a movement and set of practices by highlighting the beliefs of a subset of Portland's urban agriculture practitioners, as well as the practices currently employed by Portland's UA organizations. It presents elements of regenerative practices in urban farms and gardens that differ from rural practices in scale and intention, and that must therefore by measured and assessed differently. It contributes to the ongoing pushback against soil carbon testing as a means of assessing agriculture's ability to regenerate soils and mitigate climate change, while also pushing back against the use of the term "regenerative" as accurate or central to urban agricultural practitioner's beliefs about their work.

Though the term regenerative agriculture may fade, the techniques that are being used to improve soil health, enhance biodiversity, and provide social and community

benefits will continue to be practiced under any other name, because their roots are older than the term “regenerative,” or the terms “sustainable,” “organic,” or “permaculture.” What term and definition of success funders like PCEF choose to support matters, and should therefore be drawn from within the community of practitioners and reflective of the true history of the associated practices. Recognizing, celebrating, and funding the work of Indigenous land care organizations and those seeking to build anew the traditional soil and land care practices of cultures around the world is an important step to avoid whitewashing or settler-washing ancient practices under a more corporate friendly name.

References

About. (n.d.). *Zenger Farm*. Retrieved February 25, 2021, from https://zengerfarm.org/about-the-farm/

About PCEF. (n.d.). Portland.Gov. Retrieved February 11, 2021, from https://www.portland.gov/bps/cleanenergy/about

Anderson, C. R., Bruil, J., Chappell, M. J., Kiss, C., & Pimbert, M. P. (2021). *Agroecology Now!: Transformations Towards More Just and Sustainable Food Systems*. Springer International Publishing. https://doi.org/10.1007/978-3-030-61315-0

Anderson, S. R. (2019). *One Size Fits None: A Farm Girl's Search for the Promise of Regenerative Agriculture*. U of Nebraska Press.

Aptekar, S., & Myers, J. S. (2020). The tale of two community gardens: Green aesthetics versus food justice in the big apple. *Agriculture and Human Values*. https://doi.org/10.1007/s10460-019-10011-w

Ashtekar, J. (2021). Scaling Sustainable Agriculture: Regenerative Farming and the Next Generation of Carbon Markets » CIBO Technologies. *CIBO Technologies*. https://www.cibotechnologies.com/pathway/scaling-sustainable-agriculture-regenerative-farming-and-the-next-generation-of-carbon-markets/

Azunre, G. A., Amponsah, O., Peprah, C., Takyi, S. A., & Braimah, I. (2019). A review of the role of urban agriculture in the sustainable city discourse. *Cities*, *93*, 104–119. https://doi.org/10.1016/j.cities.2019.04.006

Baker, B. (2021, February 12). The land-healing work of George Washington Carver. *Grist*. https://grist.org/fix/george-washington-carver-environmental-legacy/

Bassett, T. (1981). Reaping on the margins: A century of community gardening in America. *Landscape*, *25*, 1–8.

Beckett, J., & Galt, R. E. (2014). Land Trusts and Beginning Farmers' Access to Land: Exploring the Relationships in Coastal California. *Journal of Agriculture, Food Systems, and Community Development*, *4*(2), 19–35. https://doi.org/10.5304/jafscd.2014.042.008

BenDor, T. K., & Doyle, M. W. (2009). Planning for Ecosystem Service Markets. *Journal of the American Planning Association*, *76*(1), 59–72. https://doi.org/10.1080/01944360903360100

Billings Jr., D. (2018). White Space, Black Space: Community Gardens in Portland, Oregon. *Dissertations and Theses*. https://doi.org/10.15760/etd.6435

Black Futures Farm. (n.d.). Retrieved December 9, 2020, from https://blackfutures.farm/

Blay-Palmer, A. (2009). The Canadian Pioneer: The Genesis of Urban Food Policy in Toronto. *International Planning Studies*, *14*(4), 401–416. https://doi.org/10.1080/13563471003642837

Bradford, M. A., Carey, C. J., Atwood, L., Bossio, D., Fenichel, E. P., Gennet, S., Fargione, J., Fisher, J. R. B., Fuller, E., Kane, D. A., Lehmann, J., Oldfield, E. E., Ordway, E. M., Rudek, J., Sanderman, J., & Wood, S. A. (2019). Soil carbon science for policy and practice. *Nature Sustainability*, *2*(12), 1070–1072. https://doi.org/10.1038/s41893-019-0431-y

Bradley, K., & Galt, R. E. (2014). Practicing food justice at Dig Deep Farms & Produce, East Bay Area, California: Self-determination as a guiding value and intersections with foodie logics. *Local Environment*, *19*(2), 172–186. https://doi.org/10.1080/13549839.2013.790350

Bradley, K., & Herrera, H. (2016). Decolonizing Food Justice: Naming, Resisting, and Researching Colonizing Forces in the Movement. *Antipode*, *48*(1), 97–114. https://doi.org/10.1111/anti.12165

Carbon. (2021). U.S. Department of Agriculture. https://www.usda.gov/oce/energy-and-environment/markets/carbon

Climate Action Plan. (2015). City of Portland and Multnomah County. https://beta.portland.gov/sites/default/files/2019-07/cap-2015_june30-2015_web_0.pdf

Clinton, N., Stuhlmacher, M., Miles, A., Aragon, N. U., Wagner, M., Georgescu, M., Herwig, C., & Gong, P. (2018). A Global Geospatial Ecosystem Services Estimate of Urban Agriculture. *Earth's Future*, *6*(1), 40–60. https://doi.org/10.1002/2017EF000536

Community Gardens | The City of Portland, Oregon. (n.d.). Retrieved December 9, 2020, from https://www.portlandoregon.gov/parks/39846

Contemporary Ohlone History. (nd). *Sogorea Te' Land Trust*. https://sogoreate-landtrust.org/contemporary-ohlone-history/

Coplen, A., & Cuneo, M. (2015). Dissolved: Lessons Learned from the Portland Multnomah Food Policy Council. *Journal of Agriculture, Food Systems, and Community Development*, *5*(2), 91–107. https://doi.org/10.5304/jafscd.2015.052.002

Cover Crop Program. (2021). Maryland Department of Agriculture. https://mda.maryland.gov/resource_conservation/pages/cover_crop.aspx

Croover-Payette, A. (2017, July 10). *Native American community, Metro work together to provide culturally appropriate access to public land*. Metro. https://www.oregonmetro.gov/news/native-american-community-metro-work-together-provide-culturally-appropriate-access-public-land

Crouch, P. (2012). Evolution or gentrification: Do urban farms lead to higher rents? *Grist*. https://grist.org/food/evolution-or-gentrification-do-urban-farms-lead-to-higher-rents/

Current Prices. (2021). UC Davis Analytical Lab. https://anlab.ucdavis.edu/Prices

Deaconu, A., Sherwood, S., Paredes, M., Berti, P., López, P., Cole, D., Muñoz, F., Oyarzún, P., Borja, R., Aizaga, M., Estrella, E., April-Lalonde, G., Mercille, G., Batal, M., & Ekomer. (2021). Promoting traditional foods for human and environmental health: Lessons from agroecology and Indigenous communities in Ecuador. *BMC Nutrition*, *7*(1), 1. https://doi.org/10.1186/s40795-020-00395-y

Dignac, M.-F., Derrien, D., Barré, P., Barot, S., Cécillon, L., Chenu, C., Chevallier, T., Freschet, G. T., Garnier, P., Guenet, B., Hedde, M., Klumpp, K., Lashermes, G., Maron, P.-A., Nunan, N., Roumet, C., & Basile-Doelsch, I. (2017). Increasing soil carbon storage: Mechanisms, effects of agricultural practices and proxies. A review. *Agronomy for Sustainable Development*, *37*(2), 14. https://doi.org/10.1007/s13593-017-0421-2

Dimitri, C., & Rogus, S. (2014). Agriculture in urban and peri-urban areas in the United States: Highlights from the Census of Agriculture. *Renewable Agriculture and Food Systems*, *30*. https://doi.org/10.1017/S1742170514000040

Dobernig, K., & Stagl, S. (2015). Growing a lifestyle movement? Exploring identity-work and lifestyle politics in urban food cultivation. *International Journal of Consumer Studies*, *39*(5), 452–458. https://doi.org/10.1111/ijcs.12222

Donovan, P. (2013). *Measuring soil carbon change*. Soil Carbon Coalition. https://soilcarboncoalition.org/

Eizenberg, E. (2012). The Changing Meaning of Community Space: Two Models of NGO Management of Community Gardens in New York City. *International Journal of Urban and Regional Research*, *36*(1), 106–120. https://doi.org/10.1111/j.1468-2427.2011.01065.x

Elevitch, C. R., Mazaroli, D. N., & Ragone, D. (2018). Agroforestry Standards for Regenerative Agriculture. *Sustainability*, *10*(9), 3337. https://doi.org/10.3390/su10093337

FAO's role in Urban Agriculture. (n.d.). Food and Agriculture Organization of the United Nations. Retrieved December 4, 2019, from http://www.fao.org/urban-agriculture/en/

Farms and Land in Farms 2019 Summary (p. 17). (2020). USDA.

Fassler, J. (2021, May 3). *Regenerative agriculture needs a reckoning*. The Counter. https://thecounter.org/regenerative-agriculture-racial-equity-climate-change-carbon-farming-environmental-issues/

Featured Program: Pathways to Farming. (2020, July 29). *Oregon Food Bank*. https://www.oregonfoodbank.org/pathways-to-farming/

Ferguson, R. S., & Lovell, S. T. (2014). Permaculture for agroecology: Design, movement, practice, and worldview. A review. *Agronomy for Sustainable Development*, *34*(2), 251–274. https://doi.org/10.1007/s13593-013-0181-6

Food policy and zoning in Portland. (2020). Portland.Gov. https://beta.portland.gov/bps/food-policy-and-zoning-portland

Food production and ecosystem management. (n.d.). Food and Agriculture Organization of the United Nations. Retrieved December 9, 2020, from http://www.fao.org/urban-food-actions/areas-of-work/food-production-and-ecosystem-management/en/

Fu, J. (2021, January 28). We're told that healthy soil sequesters huge amounts of carbon from the atmosphere. Scientists are finding that's not always the case. *The Counter*. https://thecounter.org/soil-sequestration-carbon-farming-biden-climate-strategy/

Garnett, T., Godde, C., Muller, A., Röös, E., Smith, P., & de Boer, I. (2017). *Ruminating on cattle, grazing systems, methane, nitrous oxide, the soil carbon sequestration question – and what it all means for greenhouse gas emissions*. 127.

Ghose, R., & Pettygrove, M. (2014). Urban Community Gardens as Spaces of Citizenship. *Antipode*, *46*(4), 1092–1112. https://doi.org/10.1111/anti.12077

Gibson, K. J. (2007). Bleeding Albina: A History of Community Disinvestment, 1940-2000. *Transforming Anthropology*, *15*(1), 3–25. https://doi.org/10.1525/tran.2007.15.1.03

Gómez-Baggethun, E., & Barton, D. N. (2013). Classifying and valuing ecosystem services for urban planning. *Ecological Economics*, *86*, 235–245. https://doi.org/10.1016/j.ecolecon.2012.08.019

Gray, L., Guzman, P., Glowa, K. M., & Drevno, A. G. (2014). Can home gardens scale up into movements for social change? The role of home gardens in providing food security and community change in San Jose, California. *Local Environment*, *19*(2), 187–203. https://doi.org/10.1080/13549839.2013.792048

Green Fingers. (2021). PORTLAND BLACK GARDENS. https://portlandblackgardens.weebly.com/green-fingers.html

Harland, M. (2017). THE PROPHET OF PERMACULTURE. *Resurgence & Ecologist*, *300*, 22–22. Academic Search Premier.

Harnessing Nature to Help Farmers Sustainably Feed the Planet. (2021). Indigo. https://www.indigoag.com

Hatfield, M. M., & Cohen, S. (2016). A Case Study: Urban Agriculture in Portland, Oregon 2002–2012. In S. Brown, K. McIvor, & E. Hodges Snyder (Eds.), *Sowing Seeds in the City: Ecosystem and Municipal Services* (pp. 373–388). Springer Netherlands. https://doi.org/10.1007/978-94-017-7453-6_27

Hathaway, M. D. (2016). Agroecology and permaculture: Addressing key ecological problems by rethinking and redesigning agricultural systems. *Journal of Environmental Studies and Sciences*, *6*(2), 239–250. https://doi.org/10.1007/s13412-015-0254-8

Hauter, W. (2014). The Green Giant Doesn't Live in California Anymore. In *Foodopoly*. The New Press.

HOME GARDENS – Growing Gardens. (n.d.). Retrieved September 28, 2021, from http://www.growing-gardens.org/home-gardens/

Horst, M., & Gwin, L. (2018). Land access for direct market food farmers in Oregon, USA. *Land Use Policy*, *75*, 594–611. https://doi.org/10.1016/j.landusepol.2018.01.018

Indigo Pays 267 Farmers in Milestone Progress for First Ever Scalable Ag Carbon Farming Program. (2021, September 9). Indigo Agriculture. https://www.indigoag.com/pages/news/indigo-pays-267-farmers-first-ever-scalable-ag-carbon-farming-program

Individual soil analyses. (2021). Cornell Soil Health Laboratory. https://soilhealth.cals.cornell.edu/testing-services/individual-soil-analyses/

Irazábal, C., & Punja, A. (2009). Cultivating Just Planning and Legal Institutions: A Critical Assessment of the South Central Farm Struggle in Los Angeles. *Journal of Urban Affairs*, *31*(1), 1–23. https://doi.org/10.1111/j.1467-9906.2008.00426.x

Johns, C. (2017, August 17). Measuring Soil Carbon and Soil Carbon Change. *Future Directions International*. https://www.futuredirections.org.au/publication/measuring-soil-carbon-soil-carbon-change/

Kane, D. (2015). *Carbon Sequestration Potential on Agricultural Lands: A Review of Current Science and Available Practices* (p. 36). National Sustainable Agriculture Coalition.

Kirkpatrick, J. B., & Davison, A. (2018). Home-grown: Gardens, practices and motivations in urban domestic vegetable production. *Landscape and Urban Planning*, *170*, 24–33. https://doi.org/10.1016/j.landurbplan.2017.09.023

Kulak, M., Graves, A., & Chatterton, J. (2013). Reducing greenhouse gas emissions with urban agriculture: A Life Cycle Assessment perspective. *Landscape and Urban Planning*, *111*, 68–78. https://doi.org/10.1016/j.landurbplan.2012.11.007

Lal, R. (2014). Climate Strategic Soil Management. *Challenges (20781547)*, *5*(1), 43–74. aph.

Lawson, L. (2004). The Planner in the Garden: A Historical View into the Relationship between Planning and Community Gardens. *Journal of Planning History*, *3*(2), 151–176. https://doi.org/10.1177/1538513204264752

Lele, S., Springate-Baginski, O., Lakerveld, R., Deb, D., & Dash, P. (2013). Ecosystem Services: Origins, Contributions, Pitfalls, and Alternatives. *Conservation and Society*, *11*(4), 343. https://doi.org/10.4103/0972-4923.125752

Lewis, D. (2018, August 9). A Short History of Oregon Tribes in the Contemporary Era. *NDNHISTORY RESEARCH*. https://ndnhistoryresearch.com/2018/08/09/a-short-history-of-oregon-tribes-in-the-contemporary-era/

Lin, B. B., Philpott, S. M., & Jha, S. (2015). The future of urban agriculture and biodiversity-ecosystem services: Challenges and next steps. *Basic and Applied Ecology*, *16*(3), 189–201. https://doi.org/10.1016/j.baae.2015.01.005

Luján Soto, R., Cuéllar Padilla, M., & de Vente, J. (2020). Participatory selection of soil quality indicators for monitoring the impacts of regenerative agriculture on ecosystem services. *Ecosystem Services*, *45*, 101157. https://doi.org/10.1016/j.ecoser.2020.101157

Martin, S., Doherty-Chapman, K., Wise, R., Foust, S., & Greene, K. (2012). *Growing a Sustainable Portland Metropolitan Foodshed*. 72.

McClintock, N. (2018). Cultivating (a) Sustainability Capital: Urban Agriculture, Ecogentrification, and the Uneven Valorization of Social Reproduction. *Annals of the American Association of Geographers*, *108*(2), 579–590. https://doi.org/10.1080/24694452.2017.1365582

McClintock, N., Mahmoudi, D., Simpson, M., & Santos, J. P. (2016). Socio-spatial differentiation in the Sustainable City: A mixed-methods assessment of residential gardens in metropolitan Portland, Oregon, USA. *Landscape and Urban Planning*, *148*, 1–16. https://doi.org/10.1016/j.landurbplan.2015.12.008

McClintock, N., & Simpson, M. (2014). *A Survey of Urban Agriculture Organizations and Businesses in the US and Canada: Preliminary Results*. Portland State University.

McClintock, N., Wooten, H., & Brown, A. (2012). Toward a Food Policy "First Step" in Oakland, California: A Food Policy Council's Efforts To Promote Urban Agriculture Zoning. *Journal of Agriculture, Food Systems, and Community Development*, 15–42. https://doi.org/10.5304/jafscd.2012.024.009

Members. (n.d.). Oregon Community Food Systems Network. Retrieved February 11, 2021, from http://ocfsn.net/member-organizations/

Mendes, W., Balmer, K., Kaethler, T., & Rhoads, A. (2008). Using Land Inventories to Plan for Urban Agriculture: Experiences From Portland and Vancouver. *Journal of the American Planning Association*, *74*(4), 435–449. https://doi.org/10.1080/01944360802354923

Millennium Ecosystem Assessment (Program) (Ed.). (2005). *Ecosystems and human well-being: Synthesis*. Island Press.

Mock, S. (2021, February 21). 80 Million Reasons Not to Pay for Regenerative Farming. *The Shadow*. https://medium.com/the-shadow/80-million-reasons-not-to-pay-for-regenerative-farming-75a7f1d41e94

Mollison, B., & Holmgren, David. (1987). *Permaculture one : A perennial agriculture for human settlements*. Tyalgum, N.S.W.: Tagari.

Moyles, T. (2016). Permaculture or Spermaculture? *Utne Reader: The Best of the Alternative Press*, *192*, 6–8. Academic Search Premier.

Mudbone Grown—About Us. (n.d.). Retrieved September 28, 2021, from https://www.mudbonegrown.com/about-us

Multnomah Food Action Plan: Grow and Thrive 2025. (2010). Multnomah County Office of Sustainability.

Murphy, C. (2020, April 14). Coronavirus gardening: Hobby and self sustainability create interest. *USA Today*. https://www.usatoday.com/story/money/2020/04/14/coronavirus-gardening-hobby-and-self-sustainability-create-interest/2923047001/

Native Gathering Garden at Cully Park | Community Gardens | The City of Portland, Oregon. (n.d.). Retrieved December 11, 2019, from https://www.portlandoregon.gov/parks/article/724998

Newton, P., Civita, N., Frankel-Goldwater, L., Bartel, K., & Johns, C. (2020). What Is Regenerative Agriculture? A Review of Scholar and Practitioner Definitions Based on Processes and Outcomes. *Frontiers in Sustainable Food Systems*, *4*, 194. https://doi.org/10.3389/fsufs.2020.577723

Okvat, H. A., & Zautra, A. J. (2011). Community Gardening: A Parsimonious Path to Individual, Community, and Environmental Resilience. *American Journal of Community Psychology*, *47*(3–4), 374–387. https://doi.org/10.1007/s10464-010-9404-z

Oregon Agricultural Statistics & Directory. (2021). Oregon Department of Agriculture. https://www.oregon.gov/oda/shared/Documents/Publications/Administration/AgStatsDirectory.pdf

Organic No-Till. (2021). *Rodale Institute*. https://rodaleinstitute.org/why-organic/organic-farming-practices/organic-no-till/

Our Story. (2021). *Rodale Institute*. https://rodaleinstitute.org/about/our-story/

PCEF RFP Attachment A. (2020). Portland Clean Energy Fund Grant Committee.

PCUN | Oregon Worker Relief Fund. (2021). https://pcun.org/alivio-laboral-de-oregon-oregon-worker-relief-fund/

Penniman, L., & Washington, K. (2018). *Farming While Black: Soul Fire Farm's Practical Guide to Liberation on the Land*. Chelsea Green Publishing. http://ebookcentral.proquest.com/lib/psu/detail.action?docID=5568837

Pilgeram, R. (2013). The Political and Economic Consequences of Defining Sustainable Agriculture in the US. *Sociology Compass*, *7*(2), 123–134. https://doi.org/10.1111/soc4.12015

Planning Grant Application Questions. (2020). Portland Clean Energy Fund Grant Committee.

PLANTS + WELLNESS. (n.d.). Equitable Giving Circle. Retrieved September 28, 2021, from https://www.equitablegivingcircle.org/plants

Portland Clean Energy Community Benefits Initiative. (2018). https://www.portlandoregon.gov/auditor/article/674246

Ramírez, M. M. (2015). The Elusive Inclusive: Black Food Geographies and Racialized Food Spaces. *Antipode*, *47*(3), 748–769. https://doi.org/10.1111/anti.12131

Rawal, S. (2020). *Gather* [Documentary]. Illumine Running. https://gather.film

Regenerative Organic Agriculture and Climate Change: A Down-to-Earth Solution to Global Warming. (2014). Rodale Institute. https://rodaleinstitute.org/wp-content/uploads/rodale-white-paper.pdf

Reynolds, K. (2015). Disparity Despite Diversity: Social Injustice in New York City's Urban Agriculture System. *Antipode*, *47*(1), 240–259. https://doi.org/10.1111/anti.12098

Rhodes, C. J. (2012). Feeding and healing the world: Through regenerative agriculture and permaculture. *Science Progress*, *95*(4), 345–446. https://doi.org/10.3184/003685012X13504990668392

Saldivar-tanaka, L., & Krasny, M. E. (2004). Culturing community development, neighborhood open space, and civic agriculture: The case of Latino community gardens in New York City. *Agriculture and Human Values*, *21*(4), 399–412. https://doi.org/10.1007/s10460-003-1248-9

Salzman, J., Arnold, C., Garcia, R., Hirokawa, K., Jowers, K., LeJava, J., Peloso, M., & Olander, L. (2014). The Most Important Current Research Questions in Urban Ecosystem Services. *Duke Environmental Law and Policy Forum*, *25*, 47.

Schlesinger, W. H., & Amundson, R. (2019). Managing for soil carbon sequestration: Let's get realistic. *Global Change Biology*, *25*(2), 386–389. https://doi.org/10.1111/gcb.14478

Skinner, C., Gattinger, A., Krauss, M., Krause, H.-M., Mayer, J., van der Heijden, M. G. A., & Mäder, P. (2019). The impact of long-term organic farming on soil-derived greenhouse gas emissions. *Scientific Reports*, *9*(1), 1–10. https://doi.org/10.1038/s41598-018-38207-w

Smith, V. M., Greene, R. B., & Silbernagel, J. (2013). The social and spatial dynamics of community food production: A landscape approach to policy and program development. *Landscape Ecology*, *28*(7), 1415–1426. https://doi.org/10.1007/s10980-013-9891-z

Soil Analysis Fee Schedule. (2021). A&L Laboratories. http://www.al-labs-west.com/fee-schedule.php?section=Soil%20Analysis

Soil Carbon Restoration: Can Biology do the Job? Part One. (2020, June 25). *Future Directions International*. https://www.futuredirections.org.au/publication/soil-carbon-restoration-can-biology-do-the-job-part-one/

Soil Sampling Guidelines. (2021). Regenerative Organic Certified. https://regenorganic.org/wp-content/uploads/2020/06/ROC_June2020_Soil_Sampling_Guidelines.pdf

Soil Science Review: Organic Matter. (2021, March 4). Agvise Laboratories. https://www.agvise.com/soil-science-review-organic-matter/

Startups aim to pay farmers to bury carbon pollution in soil » Yale Climate Connections. (2020, January 30). Yale Climate Connections. https://yaleclimateconnections.org/2020/01/startups-aim-to-pay-farmers-to-bury-carbon-pollution-in-soil/

Sullivan, D. M., Moore, A. D., & Brewer, L. J. (n.d.). *Soil organic matter as a soil health indicator: Sampling, testing, and interpretation*. 12.

Tautges, N. E., Chiartas, J. L., Gaudin, A. C. M., O'Geen, A. T., Herrera, I., & Scow, K. M. (2019). Deep soil inventories reveal that impacts of cover crops and compost on soil carbon sequestration differ in surface and subsurface soils. *Global Change Biology*, *25*(11), 3753–3766. https://doi.org/10.1111/gcb.14762

The Leaders Who Founded the Organic Movement. (2021, March 15). *Rodale Institute*. https://rodaleinstitute.org/blog/leaders-organic-movement/

The Side Yard Farm & Kitchen. (2020). The Side Yard. https://www.thesideyardpdx.com/

Thornbush, M. (2015). Urban agriculture in the transition to low carbon cities through urban greening. *AIMS Environmental Science*, *2*(3), 852. https://doi.org/10.3934/environsci.2015.3.852

Toensmeier, E., & Herren, H. (2016). *The Carbon Farming Solution: A Global Toolkit of Perennial Crops and Regenerative Agriculture Practices for Climate Change Mitigation and Food Security* (Illustrated edition). Chelsea Green Publishing.

Together, We're Outgrowing Hunger. (n.d.) Outgrowing Hunger. Retrieved September 28, 2021, from https://outgrowinghunger.org/

Urban Food Zoning Code Update. (2011). Bureau of Planning and Sustainability.

USDA ERS - Farm Structure. (n.d.). Retrieved December 9, 2020, from https://www.ers.usda.gov/topics/farm-economy/farm-structure-and-organization/farm-structure/

van Maasakkers, M. (2018). What Role Does Planning Have in the Creation of Ecosystem Service Markets? Evidence from Two Cases in Oregon. *Journal of Planning Education and Research*, 0739456X1877350. https://doi.org/10.1177/0739456X18773502

Vitiello, D., & Wolf-Powers, L. (2014). Growing food to grow cities? The potential of agriculture for economic and community development in the urban United States. *Community Development Journal*, *49*(4), 508–523. https://doi.org/10.1093/cdj/bst087

Welsch, J., Songling, C., Buckley, H. L., Lehto, N. J., Jones, E. E., & Case, B. S. (2019). How many samples? Soil variability affects confidence in the use of common agroecosystem soil indicators. *Ecological Indicators*, *102*, 401–409. https://doi.org/10.1016/j.ecolind.2019.02.065

Wezel, A., & Soldat, V. (2009). A quantitative and qualitative historical analysis of the scientific discipline of agroecology. *International Journal of Agricultural Sustainability*, *7*(1), 3–18. https://doi.org/10.3763/ijas.2009.0400

White, C. (2020). Why Regenerative Agriculture? *American Journal of Economics and Sociology*, *79*(3), 799–812. https://doi.org/10.1111/ajes.12334

White, M. M. (2011). Environmental Reviews & Case Studies: D-Town Farm: African American Resistance to Food Insecurity and the Transformation of Detroit. *Environmental Practice*, *13*(4), 406–417. https://doi.org/10.1017/S1466046611000408

Wires, K. N., & LaRose, J. (2019). Sogorea Te' Land Trust and Indigenous Food Sovereignty in the San Francisco Bay Area. *Journal of Agriculture, Food Systems, and Community Development*, *9*(B), 31–34. https://doi.org/10.5304/jafscd.2019.09B.003

Yang, J. Q., Zhang, X., Bourg, I. C., & Stone, H. A. (2021). 4D imaging reveals mechanisms of clay-carbon protection and release. *Nature Communications*, *12*(1), 622. https://doi.org/10.1038/s41467-020-20798-6

Zhang, Q., Li, Y., Chang, S. X., & Tian, L. (2018). Conservation agriculture practices increase soil microbial biomass carbon and nitrogen in agricultural soils: A global meta-analysis. *Soil Biology & Biochemistry*, *121*, 50–58. aph.

Appendix A: Interview Questions

Introductory Questions:

- What is your role in the organization?
- How long have you been in your current position? How long have you been a part of the organization?
- Who is in charge of the organization? How is power structured in the organization? Board of directors, owner/operator, executive director, etc.
- Who owns the land that the organization operates on?
- How stable is the organization's access to the land?
- How many staff does the organization employ?
- What communities or population does the organization aim to serve?
- How does the organization serve the communities that PCEF is intended to serve? How does organizational leadership reflect this?

Core Questions:

- What does the term regenerative agriculture mean to you? Do you use another phrase or term for the same concept?
- How did you learn about the concept of regenerative agriculture?
- What methods or practices does your organization do or use that you would consider regenerative agriculture?
- Why do you/does your organization use the regenerative practices you named previously? What benefits do you see from these practices?
- What does soil-based carbon sequestration mean to you?
- Are you measuring the impact of your organization's regenerative practices in some way? If so, what data are you collecting?
    - Specifically, do you measure soil carbon?
- Did the organization apply for PCEF funds? If not, does the organization intend to apply for PCEF funds in the future? If not, why not?
- If they applied or intend to apply for PCEF funds: If you received PCEF funds or another large source of funding, how would your organization use that money?
- What would help you further your organization's mission? What resources? What knowledge? What connections?
    - How can I help you? I am unable to provide financial incentive, but I may be able to support in other ways.
- Is there anything that I did not ask about that you would like to share on this topic?
- Who else should I be contacting about this topic?

Appendix B: Recruitment Email

Dear [Candidate],

My name is Melia Chase and I am a Master's student in PSU's Urban Studies program, undertaking thesis research on regenerative urban agriculture in Portland. I am reaching out to you in hopes that you would be willing to participate in an interview on the topic of regenerative agriculture and its potential impact, particularly as related to small-scale urban farming and gardening. The interview would be 45 minutes to 1 hour long and could take place via Zoom or phone call.

I would be thrilled to speak to you about the regenerative mission and practices of [your organization]. I know the growing season is beginning in earnest and I am happy to be flexible to find a time that works for your schedule. I understand, however, if you are unavailable at this time.

Attached you will find more information about my thesis project, as well as a preview of the interview questions and the consent form to participate in the study. If you are willing to participate, please reply via email or phone. Thank you so much for your time and consideration.

Melia Chase
Candidate, Master of Urban Studies, Portland State University

Appendix C: Consent Form

Consent to Participate in Research (No Signature)

Project Title: Regenerative Agriculture Beliefs and Practices Among Portland, Oregon Agriculturalists

Population: Portland-Area Urban Agriculture Practitioners

Researcher: Melia Chase, Masters Student, College of Urban and Public Affairs

Portland State University

Researcher Contact: chasemel@pdx.edu / 503 704 4277

You are being asked to take part in a research study. The box below highlights the main information about this research for you to consider when making a decision whether or not to join in the study. Please carefully look over the information given to you on this form. Please ask questions about any of the information you do not understand before you decide to agree to take part.

Key Information for You to Consider
• **Voluntary Consent**. You are being asked to volunteer for a research study. It is up to you whether you choose to take part or not. There is no penalty if you choose not to join in or decide to stop your involvement. • **Why is the study being done?** The reason for this research is to investigate the beliefs about regenerative agriculture and regenerative agriculture practices among Portland-area urban agriculture organizations, as well as to collect information on data collection methods already in use by organizations to measure regenerative impacts of agricultural projects. The research is being done to address gaps in the Portland Clean Energy Fund grant application's definition of and accepted measurements of regenerative agriculture. • **How long will it take?** Your participation should last approximately 45 minutes to one hour. • **What will I be expected to do?** You will be asked to answer open-ended questions related to the topics of regenerative agriculture and your professional and personal experience practicing urban agriculture. • **Risks.** Some of the possible risks or discomforts of taking part in this study include discussion of potentially emotional topics, such as racialized institutional power imbalances, climate change, colonization, and historical and ongoing land loss. These topics can be sensitive and upsetting to discuss. • **Benefits**. Although there is unlikely to be a direct benefit to yourself/your organization from participating in this research, the researcher hopes to gain an understanding of urban agriculture practitioner's methods for understanding and measuring regenerative agriculture and its impacts, and this knowledge

may be used to address gaps in the application process for the Portland Clean Energy Fund.

- **Options.** Instead of taking part in this study, you could recommend an alternate individual or organization who may prefer to participate. This recommendation is voluntary and there is no penalty for not participating nor for choosing not to recommend potential participants.

What happens to the information collected?
Information collected for this research will be used as part of a Master's thesis, and highlights may be shared with the members of the Portland Clean Energy Fund grant committee, who may choose to use the information to address gaps in the grant application process.

How will my privacy and data be protected?
The researcher will take measures to protect your privacy including omitting names and identifying characteristics from the final written results, storing interview notes and data without names or identifiable information, and obtaining direct consent before filming or recording interviews. Despite taking steps to protect your privacy, the researcher can never fully guarantee that your privacy will be protected.

To protect all of your personal information, the researcher will store interview notes and thesis materials on a password protected drive accessible only to herself. Despite these precautions, the researcher can never fully guarantee that all your study information will not be revealed.

Individuals and organizations that conduct or monitor this research may be permitted access to inspect research records. This may include private information. These individuals and organizations include the Institutional Review Board that reviewed this research and the researcher's graduate thesis committee.

What if I want to stop my part in this research?
Your part in this study is voluntary. You do not have to take part in this study, but if you do, you may stop at any time. You have the right to choose not to take part in any study activity or completely stop at any point without penalty. Your decision whether or not to join in will not affect your relationship with the researcher or Portland State University.

Who can answer my questions about this research?
If you have questions, concerns, or have experienced a research related injury, contact the researcher at:

Melia Chase
503 704 4277 / chasemel@pdx.edu

Who can I speak to about my rights as a research participant?

The Portland State University Institutional Review Board ("IRB") is overseeing this research. The IRB is a group of people who independently review research studies to ensure the rights and welfare of participants are protected. The Office of Research Integrity is the office at Portland State University that supports the IRB. If you have questions about your rights, or wish to speak with someone other than the research team, you may contact:

Office of Research Integrity
PO Box 751
Portland, OR 97207-0751
Phone: (503) 725-5484 / Toll Free: 1 (877) 480-4400
Email: psuirb@pdx.edu

STATEMENT OF CONSENT

I have had the opportunity to read and consider the information in this form. I have asked any questions necessary to make a decision about my participation. I understand that I can ask additional questions throughout my participation.

I understand that I am not waiving any legal rights. I have been provided with a copy of this consent form.

As described above, my interview answers will be collected for research purposes. My interview answers will be used for data analysis only.

□ I agree to take part in this study

□ I do not agree to take part in this study

□ I agree to the use of audio/video recording, which will only be used by researchers to recount specifics of the interviews.

□ I agree to waive my right to confidentiality, in whole ( ) or in part ( ), i.e., except where I explicitly request during or after the interview not to be quoted or attributed. I retain the right to revoke this waiver at any point in the future.