Cultivating Change: Developing a Regenerative Agriculture Playbook for TechnoServe

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Executive Summary

Regenerative agriculture prioritizes soil health, biodiversity, and the long-term sustainability of farms. In contrast to conventional farming methods, it focuses on restoring ecosystems while promoting social and environmental justice. This Master's Project partners with TechnoServe, a global anti-poverty non-profit, in developing a practical and evidence-based resource to help smallholder farms adopt regenerative agricultural practices that can improve ecosystem health, enhance food security, and increase economic resilience.

Through a combination of literature reviews, field interviews, and collaboration with TechnoServe staff, our team developed an initial "Intervention Library" for TechnoServe's internal *Regenerative Agriculture Playbook*. The Intervention Library consists of 12 comprehensive entries on a range of regenerative topics, including agroforestry, cover cropping, mulching, and drip irrigation. Each entry provides guidance on implementation, context-specific considerations, potential outcomes, and TechnoServe's previous experience with the practice. Interviews with TechnoServe staff emphasized the importance of providing past program efforts and their outcomes and of focusing on adaptable, cost-effective approaches that meet the needs of smallholder farmers.

The Playbook is intended to support TechnoServe staff in program design and field implementation as well as the transfer of internal knowledge. It enables users to quickly identify proven practices, understand how to adapt them to local contexts, and replicate previous successful outcomes. While primarily an internal tool, the Playbook also has the potential to benefit a wider audience, including other NGOs, funders, and agricultural stakeholders.

This project represents an important step toward scaling regenerative agriculture through accessible knowledge sharing. Ongoing maintenance, regional adaptation, and future expansion will be critical to maximizing its impact. The Playbook bridges the gap between academic research and real-world applications, which we hope will contribute towards cultivating a more sustainable future for agriculture.

Introduction

What is Regenerative Agriculture?

While agriculture has been largely foundational to the growth of modern society, unsustainable practices have often led to the degradation of the ecosystems on which it relies (FAO, 2021, NRDC, 2021). By prioritizing yields over environmental health, modern agriculture has disrupted natural ecosystems and depleted natural resources, with the long-term ecological consequences often treated as an afterthought. This presents a critical challenge: how to meet the food demands of a growing population while allowing damaged ecosystems to recover and reduce environmental harm moving forward. A promising approach to address food insecurity and ecosystem recovery lies in regenerative agriculture (LaCanne & Lundgren 2018).

In contrast to conventional agriculture, regenerative agriculture places ecosystem health at the center of food production, focusing on practices that restore soil function, improve biodiversity, and enhance ecosystem services (Schreefel et al., 2020). In addition, regenerative agriculture takes a holistic approach that considers the wellbeing of the communities who produce food as well. Social and environmental justice are cornerstones of this framework, ensuring that food production does not come at the expense of the fair treatment of workers at every level of the supply chain (Loring, 2021).

Regenerative agricultural practices are tailored to maintain the principles of minimizing soil disturbance, allowing soils to remain covered, keeping roots alive in soil year round, encouraging biodiversity, and integrating livestock (Khangura et al., 2023). Practices such as cover cropping and crop rotation enhance soil health and biodiversity by introducing crop diversity into farming systems and fostering symbiotic relationships with soil microbes, insects, and fungi (Kabenomuhangi, 2023). Integrated pest and weed management offers alternatives to chemical control by helping farmers use natural processes, such as beneficial insects, crop diversity, and cultural practices, to manage harmful pests and invasive plants. Practices like drip irrigation and mulching help smallholders manage water more efficiently by reducing evaporation and runoff,

lowering irrigation costs, and improving resilience during dry periods. Agroforestry and silvopasture integrate trees, crops, and in the case of silvopasture, livestock, into a single system, which improves ecological health while enabling smallholders to diversify their production through a combination of crops, livestock, and timber. In addition to ecological benefits, regenerative agriculture contributes to climate change mitigation by increasing carbon sequestration through practices that build soil organic matter and reduce emissions (Rhodes, 2017). While these practices are powerful for shifting traditional agricultural methods to ones that focus on ecological restoration and sustainable food production, the adoption of these practices requires social, economic, and institutional support.

Who is TechnoServe?

TechnoServe is an international nonprofit organization that partners with smallholder farms in developing countries, providing them with the tools, training, and market access needed to build more sustainable and resilient agricultural systems (USAID, 2020). Since its founding in 1968, TechnoServe has worked with more than four million farmers and entrepreneurs across 40 countries, helping them improve their livelihoods and the sustainability of their operations. Because a significant share of the global food supply is produced by smallholder farms, TechnoServe's focus on strengthening the resilience of these farming systems is critical to addressing the issue of food insecurity in developing countries (Ricciardi et al., 2018). Research has also shown that the adoption of regenerative practices is positively associated with improved food security outcomes among smallholders, with each additional practice increasing the likelihood of household food security (Niles et al, 2021). Encouraging smallholders to adopt unfamiliar techniques is a significant challenge, particularly when those practices involve a high upfront cost or are perceived as a financial risk. TechnoServe has established a strong international reputation for putting the livelihoods of smallholders at the forefront of its work, which has led to many successful projects that have enhanced the resilience, sustainability, and

profitability of farming operations around the world (Dalberg Global Development Advisors, 2016).

Launched in 2019, TechnoServe's Smallholder Market Access Program worked with nearly 9,000 farmers across Guatemala and Nicaragua to provide training in regenerative agricultural techniques, expand market access, and improve crop yields (TechnoServe, 2022). Farmers received training in practices such as cover cropping and natural pest control, which improved soil health and reduced reliance on synthetic inputs. As a result, 82% of participants reported adopting at least one regenerative agriculture practice, leading to an average 11% increase in crop yields. The program also led to a 17% increase in income, with farmers earning an average of $422 more annually. To expand market access, TechnoServe connected farmers with formal buyers and agricultural exporters, giving them access to higher-value supply chains such as supermarkets and food processors (TechnoServe, 2024). This program illustrates how regenerative agriculture can be both ecologically and financially viable for smallholder farmers.

While TechnoServe has demonstrated widespread success in implementing regenerative agriculture with smallholder farmers, scaling these efforts to reach a broader audience will require more accessible, organized, and actionable information. Many smallholders operate in resource-limited environments where access to training and technical knowledge is often limited or inconsistent. By expanding and refining TechnoServe's database of regenerative practices, our project aims to make these techniques more digestible, adaptable, and easier to disseminate. In doing so, we hope to support TechnoServe in broadening its impact and reaching a wider farming population.

MP Objectives

Our team collaborated with TechnoServe to develop a comprehensive library of regenerative agriculture interventions aimed at supporting smallholder farmers. Over the course of 2024 and 2025, we contributed to the development of TechnoServe's Regenerative Agriculture Playbook

by building an “Intervention Library” that agricultural extension providers can use to better integrate regenerative practices into their work.

The main objectives of the project included:

1. Reviewing internal TechnoServe reports, impact studies, and external academic literature to identify best practices, useful tools, and key lessons for a set of prioritized interventions.
2. Conducting interviews with TechnoServe staff working in the field to gather insights on how regenerative practices are implemented, along with region-specific guidance and practical challenges.
3. Drafting detailed descriptions of selected interventions, including guidance on implementation, business case considerations and their potential impact on farmers, ecosystems, and climate outcomes.

Ultimately, this project is designed to support TechnoServe’s efforts to expand regenerative agriculture to an increasing number of smallholder communities, giving actionable guidance that is both practical and rooted in evidence.

Process & Methods

To support the development of the Regenerative Agriculture Playbook, our client TechnoServe provided a preliminary list of regenerative agriculture practices for research and inclusion. After signing a non-disclosure agreement, our team also gained access to a range of internal materials, including project data, reports, and program documents that informed the design of the Intervention Library.

Throughout the project period, we held bi-weekly meetings with our TechnoServe point of contact, Joanie Abbott. These meetings were used to review the list of selected practices, clarify the scope of our work, and determine next steps for developing and refining the Playbook.

We began by conducting a literature review of TechnoServe's internal materials, which included both programmatic studies and formal impact assessments. These were reviewed to identify recurring themes, best practices, and lessons learned from previous regenerative agriculture projects across different regions. In parallel, we conducted an academic literature review using the Duke University Library search engine. Databases such as JSTOR, Web of Science, and ScienceDirect were used to find peer-reviewed articles on regenerative practices relevant to smallholder systems. In cases where internal data was limited, we supplemented our review with gray literature and publicly available resources from organizations including the Food and Agriculture Organization (FAO), The Nature Conservancy, and the World Resources Institute.

To complement the literature review, we conducted semi-structured interviews with two TechnoServe staff members, who were chosen based on their position within TechnoServe to have the insight needed to convey TechnoServe's needs. These interviews helped validate our findings from the literature and offered practical, region-specific insights into how interventions are implemented on the ground. Speaking directly with TechnoServe staff helped us shape the tone, structure, and depth of the guidance to better fit their needs.

Following the research and data collection phase, we synthesized our findings into a set of planning and implementation considerations for each intervention. These were organized using a consistent framework applied to each practice:

1. Executive Summary of Regenerative Agriculture Interventions
2. "What is it?"
3. When and Where to Implement
4. "Why It Matters"
5. How to Implement and Measure
6. Past TechnoServe Qualifications

7. Sources

This format was designed to make the information both actionable and easy to navigate for agricultural extension providers. The draft Playbook was submitted to TechnoServe for feedback and underwent multiple rounds of revision based on input from both the client and our project team. The final version will be published internally on TechnoServe's staff platform and used as a reference for future regenerative agriculture programming.

Results: Playbook Entries

In total, we completed 12 playbook entries on the following topics:

- Agroforestry
- Cover Cropping
- Crop Rotation
- Drip Irrigation
- Integrated Pest Management
- Integrated Weed Management
- Limited/No Till
- Mulching
- Natural Habitat Restoration
- Rotational Grazing
- Silvopasture
- Tunnels

An example entry for Limited/No Till is included in the Appendix, with TechnoServe qualifications redacted.

Results: Interview Summaries

Wesley Latham, Coffee Program Manager at TechnoServe:

Wesley brought experience in the field implementing regenerative practices in addition to administrative experience designing and managing program initiatives. He emphasized the difficulty of creating standardized, one-size-fits-all methods across cultural and environmental contexts. Implementation details as well as instructional approaches may not neatly apply across different regions, countries, or communities. To that end, providing knowledge on past programs and their strategies can help program implementers adapt their methods to be more successful. Lastly, he stressed the importance of prioritizing cost-effective, accessible inputs and yield improvement to best serve the needs of their clients.

Wesley's insights highlighted the utility of including "TechnoServe Qualifications" and internal contacts as a means of informing future practitioners of past program outcomes. His point on adaptability also suggests that organizing Playbook entries by region or crop may be additionally useful for searchability. Following the interview, drafted entries were also audited and edited to emphasize inputs and methods more accessible to smallholder farmers.

Salome Begeladze, Natural Climate Solutions Manager at TechnoServe:

Salome echoed the need to tailor approaches to local contexts to best serve communities. In addition, she emphasized addressing challenges at the broader, "landscape" level, taking into account political and environmental issues and ensuring that programs dealt with the root of problems rather than focusing solely on implementing specific practices. While handling political nuance was out of scope for our initial entries, further cataloguing the entries by outcome or metric may facilitate switching between practices to achieve the same desired effects, enabling field teams to draw on a greater range of practices when adapting programs. Salome also suggested that the Playbook could incorporate business management techniques alongside agricultural ones. Many of the agricultural practices double as business management practices in terms of decreasing costs and improving profitability, but future entries could certainly include

some explicitly business-focused strategies that align with regenerative ideals, such as fair labor, gender and youth empowerment, and circularity.

Playbook Benefits and Limitations

Benefits of the Regenerative Agriculture Playbook include providing easily digestible context to stakeholders across multiple levels of TechnoServe. Administrators evaluating proposals or developing new initiatives can access a concise, high-level overview of various agricultural practices, along with their historical success rates and outcomes, allowing for more informed decision-making. Proposal writers and program designers can leverage the playbook to identify which approaches have worked in the past and what practices may be most relevant to a new region. Additionally, field teams facing unexpected resource constraints can use the playbook to find alternative, proven methods to achieve similar outcomes. The playbook also helps facilitate new hire onboarding and knowledge transfer, ensuring project and team learnings are shared across the organization.

In terms of limitations, while the playbook seeks to provide high-level understanding across a broad range of topics, practice implementation will likely require deeper, more specific knowledge. Successful implementation of any given practice still requires teams with significant past experience or access to additional information. Real-world applications may vary widely depending on local climates and resource availability, the range and complexity of which are difficult to capture in bite-size listings. Moreover, given the very broad range of topics covered under the term regenerative agriculture, we were only able to capture a subset of the space. The best solution for a specific farm or farmer may not be found in our listings or may even be a particular combination of them. Lastly, as a static resource, the playbook will require active maintenance to stay up to date as more techniques are studied and programs are implemented.

As an aside, while the playbook is intended for TechnoServe to use internally, a public version may also be beneficial for other parties. Potential audiences could include farmers seeking a high-level overview of suitable regenerative techniques, other non-profits and governmental entities working with farmers, and lenders and investors in the agricultural space. It could even serve as a resource for those simply hoping to understand more about how their food is produced.

Notes on the Listing Process

The process of creating listings led to some key learnings that may be useful for future contributors to the Regenerative Agriculture Playbook. Firstly, we emphasize the importance of accessibility over academic detail to maximize the value of the playbook to its users. Secondly, we found that input from TechnoServe employees through staff interviews was crucial to understanding past success stories and the usefulness or applicability of specific practices in specific regions. Lastly, the process of dividing up and organizing listings was surprisingly complex. For example, we ended up having entries for both Silvopasture and Agroforestry but would ideally represent one as a subsection of the other. Balancing granularity with accessibility was an ongoing challenge that will likely require more user feedback to refine.

Open Questions

We suggest the following open questions as areas that remain to be explored by TechnoServe or future student teams:

1. How can the listings be best organized for their intended use case, e.g. by outcome, by inputs, by region?
2. How can this playbook be maintained and expanded upon for the future?
3. What additional tools or resources are needed for regenerative agriculture implementation? What are the biggest barriers besides knowledge transfer?
4. What cultural or community-level adaptations might be made for teaching or practices to be most effective?

Conclusion

Regenerative agricultural practices show great potential for addressing environmental, economic, and social issues at a large scale and at the individual and community level. Progress towards climate resilience, economic stability, and agricultural equity can be achieved by the implementation of those practices, however there are some challenges that need to be addressed for its successful application at scale. While regenerative agriculture practices have the potential to improve the environments in which they are used, smallholders may be hesitant to adopt them if there is a high up-front cost to their establishment (Page and Witt, 2022). In addition, many practices should be tailored to specific geographies, climates, and established agricultural practices to ensure their success (Khangura et al., 2023). This playbook has been designed to address these issues in a comprehensible manner to assist TechnoServe in serving their clients and produce the desired environmental, economic, and social changes.

To support the transition to regenerative agriculture, we developed the Regenerative Agriculture Playbook using a multi-faceted research approach. This included an extensive literature review of TechnoServe's impact studies, academic research, and external reports to identify best practices. Additionally, we conducted interviews with TechnoServe field teams to validate findings, incorporate practical insights, and ensure that the interventions were adaptable to diverse farming contexts. The Playbook was designed to provide clear, actionable guidance for

agricultural extension providers, enabling them to support smallholder farmers in implementing regenerative practices effectively.

The next steps for the project could also include exploring more region-specific approaches, such as climate conditions, crop types, and available resources that may vary across different areas. This would allow for a more strategic implementation plan that maximizes the potential benefits for farmers. Incorporating farmer feedback into the design and rollout of these interventions will be key to ensuring that the strategies are practical and adaptable, enhancing the likelihood of success. Traditionally, a major hurdle to the successful implementation of these practices by smallholders is a lack of communication to growers for what they can expect when they adopt the practices, a gap this Playbook seeks to fill.

While the Playbook serves as an essential internal tool, the broader implications of its insights extend to global agricultural stakeholders, including farmers, policymakers, investors, and development organizations. Future efforts should focus on expanding accessibility, refining intervention strategies, and integrating new research to continuously improve implementation outcomes. Ultimately, the success of regenerative agriculture hinges on collective action, bridging the gap between knowledge and practice to cultivate not only sustainable farms but also a more resilient planet.

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Appendix: Limited/No Till Entry with TechnoServe Information Redacted

Section	Example	
Photo Slider		https://www.climatehubs.usda.gov/hubs/northwest/topic/northwest-no-till-farming-climate-resilience
Title Bar	Limited/No Till	
Executive summary	No or low till farming minimizes soil disturbance when planting, relying on hand tools and other regenerative practices, such as mulching, to control weeds. No-till can reduce soil erosion, improve water retention, and decrease need for inputs but increase susceptibility to weeds and pests. Other techniques such as cover crops, crop rotations, and spot applications of herbicides and pesticides can be used to control weeds and pests.	https://www.ars.usda.gov/oc/dof/ars-scientist-highlights-till-vs-no-till-farming/ https://eos.com/blog/no-till-farming/ https://www.usda.gov/about-usda/news/blog/saving-money-time-and-soil-economics-n

		o-till-farming

"What it is"	• Avoiding intensive tilling that deeply disturbs the soil
	• If tilling cannot be avoided, **conservation tillage** (leaving 30% of plant matter in the field after harvest) is a less intensive form
	• Types of conservation tillage include
	  ○ **Mulch tillage** - tilling the surface of the field and covering with crop residues (mulching)
	  ○ **Ridge tillage** - forming raised ridges or beds. After harvest, the top of the ridge may be removed instead of tilling the entire field
	  ○ **Zone tillage** - tilling in strips, with bands of un-tilled soil between planting areas
	  ○ **No tillage** - direct seed planting into undisturbed soil
	• Other practices including cover crops, mulching, and crop rotations are frequently used in conjunction for more holistic weed and pest management
	• Specialized tools for no till such as rollers, flail mowers, or seed drills exist but may be prohibitively expensive for small farms and require cost-sharing, co-investments, or subsidies
		TechnoServe project reports and studies
		
		https://rodaleinstitute.org/why-organic/organic-farming-practices/organic-no-till/
		
		https://regenerationinternational.org/2018/06/24/no-till-farming/
		
		https://www.ers.usda.gov/topics/farm-practices-management/crop-livestock-practices/soil-tillage-and-crop-rotation
		
		https://www.sare.org/sare-category/crop-production/conservation-tillage/ridge-tillage/
		
		https://www.sciencedirect.com/science/article/pii/B9780123485304002708

"When and where to implement"	Prioritize on farms with: • Erosion-prone soil • Steep slopes • Degraded soils from intensive tilling • Other regenerative techniques such as cover cropping and crop rotations in order to control weeds and moisture levels • Low pest pressure, as no-till can increase likelihood of pest cycles • Harvest season is the best time to begin a no-till transition with cover cropping. Cover cropping helps to manage soil moisture and slow herbicide resistance.	TechnoServe project reports and studies https://www.ars.usda.gov/oc/dof/ars-scientist-highlights-till-vs-no-till-farming/
Why it matters:	• Environmental impact: Reduces erosion and fossil fuel usage. Compared to conventional tilling, no-till minimizes the release of greenhouse gases stored in soils. • Business case: Require fewer fossil fuel inputs and can increase yields over time from soil restoration, improved water filtration, and soil organic matter retention. Less equipment required for start-up compared to conventional tilling on smaller plots. • Additional factors: Helps retain top soil!	Academic literature TechnoServe project reports and studies
How to implement and measure:	For smallholder farms already using primarily hand tools or small plows, no/low till implementation may simply mean further reducing soil disturbance. Farms can leave more plant residue in the fields after harvest, reduce tilling depth or frequency if possible, or practice one of the conservation tillage methods listed above. Other practices such as cover crops and mulching are recommended to reduce weed growth and provide additional	Staff interviews https://www.motherearthnews.com/homesteading-and-livestock/best-tools-for-no-till-farming-zm0z16djz

	benefits. Crop rotations can help break pest cycles. Since reducing tillage may increase weed and pest susceptibility, spot treatments of herbicides and pesticides may also be needed. Larger plots, such as conventional farmers in the US, may require investments in drills or slicers for seed planting or rollers/crimpers for removing cover crops. See detailed resources and guidance below: ***Budget considerations*** • Staff LoE: Training and supervision costs • Materials: Hand tools for planting; any materials for complementary practices such as organic matter for mulching. Larger plots may require new tractor attachments such as slicers, rollers, subsoilers, or rotary harrows. • Other: Consider use in conjunction with cover cropping and crop rotations in order to avoid herbicide resistance. ***Relevant outcomes & metrics:*** See Regenerative Business Indicator Bank for details and measurement guidance. • Increased yields • Decreased operational costs • Reduced GHG footprint • Reduced use of chemical inputs • Improved soil health • Resilience	mar/ Regenerative Business Indicator Bank
Resources	• USDA Guide to No-Till • No-Till Farming for Climate Resilience • No-Till Tips	