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# Planning, Designing, Piloting, and Scaling Natural Resource Management Innovations Amidst National Fragility: A Qualitative Investigation in Haiti

**Gloria C. Blaise**

gcb83@cornell.edu

Ashley School of Global Development, Cornell University, Ithaca, USA https://orcid.org/0000-0001-8780-5976

**Shorna B. Allred**

University of North Carolina at Chapel Hill https://orcid.org/0000-0001-6237-0638

**Louise E. Buck**

Ashley School of Global Development, Cornell University, Ithaca, USA https://orcid.org/0000-0001-8790-7323

**Arundhati Jagadish**

Nature Conservation Foundation, Mysore, India https://orcid.org/0000-0002-6360-6179

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# Abstract

Researchers and practitioners call for scaling natural resource management (NRM) practices that restore degraded lands, deliver ecosystem services, and secure livelihoods. However, fragile contexts present infrastructural and development limitations to implementation. This study utilized the Scaling Innovations Theoretical Framework to examine the factors influencing NRM implementation in Haiti. Data triangulated from six focus groups, 28 individual interviews, and sources of secondary data suggest that, despite the rugged landscape and various shocks that challenge development progress, projects can successfully move beyond the pilot and reach scale when substantive consideration is given to collaborations, partnerships, and networks in the planning, design, and pilot phases. Successful scaling also requires human and financial resources are commensurate with the scale of program growth. Understanding how these factors shape outcomes can help institutional stakeholders avoid major NRM scaling pitfalls before they happen.


# 1. Introduction

Scaling up refers to the process of expanding, replicating, adapting, and sustaining successful programs and policies in space and over time to reach more people (Chandy and Linn 2011). For decades, natural resource management (NRM) practitioners and researchers have explored and refined how projects can be brought to scale, with a particular focus on countries in Africa, Asia, and Latin America (Franzel et al. 2004; Westermann et al. 2018). Scaling often starts as a pilot or grassroots project, which is implemented, and then based on the outcomes relative to stated goals, is scaled out, up, or deep (Moore et al. 2015; Pienkowski et al. 2024).

Moore and colleagues (2015) characterize scaling in three dimensions: scaling out, scaling up, and scaling deep. For example, a prior study exploring the scalability of community-based agroforestry in Haiti demonstrated how an initiative scaled out by leveraging a hospital network to increase its uptake (Blaise et al. 2024). In Nepal, the Forestry Act of 1993 gave Community Forestry User Groups (CFUGs) the authority to manage and govern forest land, thus supporting scaling up sustainable forest management (Binod 2017). Lastly, an example of scaling deep has been demonstrated by a case study on agroecology in London that invests in training and developing communities of practice for under-resourced communities (Nicol 2020).

# 1.1. Scaling Innovations Theoretical Framework

An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption (regardless of when it was invented) as defined by Rogers (1995). Numerous factors can influence how an innovation is scaled out, up, or deep. Building on Moore and colleagues (2015), Breaugh et al. (2021) utilizes a cross-disciplinary literature review to derive the Scaling Innovations Theoretical Framework (SITF) consisting of 11 contextual factors that influence the outcomes of scaling an innovation. The 11 contextual factors span three categories: 1) External Factors, 2) Organizational

Factors, and 3) Project Factors. These factors can act as drivers and/or barriers to scaling and ultimately influence scaling outcomes. These scaling outcomes influence the innovation's impact and simultaneously create a feedback into the system, ultimately having an effect on how the contextual factors continue to influence the scaling process.

The SITF builds on Rogers' (1995) seminal work on Diffusion of Innovations (DOI) but extends it further by pointing out that traditional diffusion-thinking and methods do not account for the proactive agency and strategic decision-making of individual and organizational actors (Breaugh et al. 2021). Innovation scaling is characterized by proactive and strategic actors that are purposely moving innovations into new contexts (Breaugh et al., 2021). But similar to DOI, proponents of the SITF also urge practitioners to consider the impact and relevance of an innovation to the population through factors such as compatibility with values, beliefs, and existing practices (Rogers 2003; Breaugh et al. 2021). This is especially important in contexts experiencing fragility in multiple dimensions wherein communities must balance urgent livelihood needs (Blaise and Allred 2021; Mohammed and Favretto 2025).

## 1.2. Scaling Pitfalls and Challenges

Researchers have advocated for the scaling of NRM initiatives such as agroforestry, climate-smart agriculture, farmer field schools, among others, with the potential to deliver critical benefits to livelihoods, biodiversity conservation, and sustainable landscape management (Buck et al. 2020; Johansson et al. 2013; Muilerman et al. 2018; Westermann et al. 2018). However, when scaling becomes the ultimate goal, several pitfalls can occur, including declined effectiveness, project abandonment, and unintentional scaling of bad practices that undermine the intended positive outcomes (Pienkowski et al. 2024). For example, Pienkowski and colleagues highlight that when pilots are implemented, they are done so with all of the ideal conditions (e.g., adequate staff, interest, and financial resources); those human and financial resources may not be realistic or present beyond the pilot phase, thus likely to decrease in effectiveness. It is also possible that the project reporting and evaluation demands of funding institutions can take up considerable amounts of staff time, even beyond the controlled pilot phase. For example, in Kenya, Ghana, and Mozambique, senior program officials were spending as much as half of their time addressing the needs of development assistance donors (Fengler and Kharas 2010). Even more challenging, within a fragile context, that is, countries experiencing a combination of exposure to risk and insufficient resilience of a state, system, and/or community to manage, absorb, or mitigate those risks (OECD 2025), numerous other factors can further derail how a development effort can be scaled (Chandy and Linn 2011). Paradoxically, despite contributing the least to climate change, fragile contexts will be the most impacted by its effects, which further hampers scaling efforts that address climate-related environmental degradation (Crawford et al. 2015).

## 1.3. Scaling at the Intersection of Fragility and Rurality

Earlier research on scaling up development activities in areas experiencing fragility suggests a critical need for upfront contextual analysis to build the evidence base for successful scaling (Chandy and Linn 2011). However, most of what we know from the recent literature about how scaling up occurs has been

learned from countries with relatively strong governments (Mascia and Mills 2018; Romero-de-Diego et al. 2021); the proposed implications may not translate well within a fragile context demanding flexibility and adaptability. For example, in a context experiencing consistent political instability or corruption, bad practices identified in the conservation literature (Benjaminsen et al. 2013; Jagadish et al. 2021; Kolstad and Søreide 2009) including elite capture, selective engagement, coercion, among others, are more likely to occur and diminish expected positive outcomes of a conservation initiative (Pienkowski et al. 2024). Despite this, Brooks and colleagues (2012) show that well-designed NRM projects can succeed even in fragile contexts when local capacity-building in communities and specific characteristics of communities (e.g., informal land tenure arrangements, local traditions and beliefs) are taken into account in the project design and implementation.

An additional layer of complexity is present when considering the rural disparities that further challenge development efforts in communities in fragile contexts where NRM projects are implemented. Lack of paved roads and access to basic household essentials, as well as limited presence of public institutions, can pose numerous barriers to rural development and NRM program implementation, as exemplified in Haiti (Coello et al. 2014). Governance institutions and regulations often are centralized in major cities and do not empower rural communities in decision-making processes (Larson and Soto 2008). Similarly, financial, human, and technological resources are concentrated in urban and peri-urban areas, leaving rural areas to stretch resources across vast areas of land as observed, for example, in six developing countries in Africa, Asia and Latin America, despite purported decentralization efforts (Ribot et al. 2006). Therefore, exploring the factors that influence how NRM programs are successfully planned, designed, piloted, and scaled within a rural context experiencing fragility provides an opportunity to draw critical and timely insights that can inform sustainable implementation and impact of NRM practices. To fill this knowledge gap, we turned our attention to one of the most environmentally vulnerable and fragile contexts with a history of rural development projects.

## 1.4. The Haiti Context

Haiti is the most populous and second-largest island nation in the Caribbean; roughly half of the population lives in rural areas (IHSI 2024). The rural agrarian landscape of Haiti is dominated by livelihood activities such as small-scale farming, masonry, animal rearing, manufacturing, personal services, product sale, and resale (Blaise and Allred 2021; Tarter 2010). Since the 1950s, there have been numerous NRM projects aiming to restore forests, reduce poverty, and conserve natural resources (Smucker and Timyan 1995). In 2021, Haiti was ranked the third most vulnerable nation to climate change (Eckstein et al. 2021), illustrating its high exposure to the effects of climate change. Based on the Organisation for Economic Co-operation and Development (OECD)’s recent States of Fragility reports, Haiti also faces several challenges in the environmental, human, security, and political dimensions; ranking the ninth most fragile context out of 177 nation (2025). Consequently, several international and domestic NGOs and development agencies have attempted to address these critical challenges. However, as Étienne (1997) argued, the proliferation of NGOs in Haiti has also raised concerns about the

fragmentation and coordination of development efforts, the displacement of state institutions, and the long-term implications for national ownership of the development process.

The NRM literature on Haiti has primarily focused on agroforestry adoption studies and land management strategies. Most notably, the Agroforestry Outreach Project (AOP) (1981–1991) was the very first large-scale agroforestry project with wide reach across all ten departments (Bannister and Josiah 1993). Researchers have attributed AOP's success to their integration of local indigenous knowledge and tree culture, collaborations between NGOs and grassroots organizations (Bayard et al. 2004; Murray and Bannister 2004), and a funding mechanism independent of the national government that reduced delays during moments of political instability (Murray and Bannister 2004; Tarter 2010). Researchers have linked a community-based agroforestry program's restoration and adoption success in Haiti to their reliance on local expert staff and intentional investments in local leadership (Sprenkle 2008). Additionally, Fischer and Levy (2012) found that leveraging watershed-level community norms and land-tenure arrangements were essential to include in NRM program design.

Research on NRM and adoption scaling in Haiti, however, has been significantly limited in recent years. Prior work in Haiti which found the importance of institutional infrastructure, cross-sector collaboration, and social networks in facilitating the adoption, scaling, and sustainability of community-based agroforestry is among the few recent NRM-focused studies in the country (Blaise et al. 2024). Taken together, the literature suggests that successful NRM implementation in Haiti is influenced by contextual realities that must be taken into account. Consequently, we used the SITF to examine the factors influencing the conceptualization, design, and implementation of NRM projects and answer the following questions in this research: 1) How are NRM projects being planned, designed, and piloted in Haiti? 2) Beyond the pilot, how are established programs being scaled, if at all? An overview of the conceptual framework for this study which situates the Scaling Innovations Framework within a context experiencing fragility is presented in Fig. 1 of Supplementary Information S1.

## 2. Methods

# 2.1. Case Study Design and Recruitment

This study employed an embedded exploratory case study design (Scholz and Tietje 2002) to study NRM innovations from conceptualization to scaling outcomes. This methodology involves investigating the overarching case (i.e., NRM implementation and scaling in Haiti) while simultaneously examining smaller sub-units (i.e., individual NRM organizations), thus allowing us to get a broad and detailed understanding of the phenomena (i.e., program planning, design, implementation, and scaling). Figure 2 and Fig. 3 in Supplementary Information S1 provide an overview of the case study design.

Program managers, researchers, government staff, technicians, and program directors from organizations doing work in Haiti were purposely sampled given they met the following inclusion criteria: 1) must be an established and recognized organization, 2) have implemented a form of natural resource

management, 3) operated for at least five years between 1981 and 2023. This period reflected critical moments in Haiti's contemporary history including but not limited to the implementation of a national-level agroforestry program, the end of a dictatorship, a turbulent start of a democracy, a presidential coup d'état, deadly hurricanes, and a devastating earthquake. Following approval from the Cornell University Institutional Review Board (Protocol IRB# 0146791), individuals were recruited between June 2022 and January 2023 through an existing email list of environmental programs in Haiti and through personal networks of the research team with ties to Haiti. A snowball sampling approach was used to gain access to more eligible participants in similar fields.

## 2.2. Data Collection

### 2.2.1. Software and Management

Data collection took place between January and July 2023. Due to the insecurity within the study area at the time of this research, the case study was conducted using a hybrid approach which included both in-person and remote methods. We utilized Zoom software and audio recorders for remote and hybrid interviews, ABBYY FineReader for scanned documents, Dedoose software for qualitative data coding and analysis, and shared drive access for data storage (Google and Box). Upon data collection, a Microsoft Excel spreadsheet was used to apply consistent file names, record key details such as file location, webpage link, notes, and organize the materials to support subsequent analysis.

### 2.2.2. Primary Data

After obtaining consent, participants completed an audio-recorded interview or focus group in English or Haitian Creole. GCB and SBA conducted a series of focus groups (n = 6) with members of four organizations, including three that served as the embedded cases. GCB conducted all of the semi-structured interviews (n = 27). Focus groups ranged from one and a half to two hours and individual interviews ranged from 30 to 60 minutes. One (n = 1) unstructured interview was conducted with a focus group participant who offered to provide additional individual perspectives outside of the focus groups. The qualitative instruments are provided in Supplementary Information S2. The recordings were transcribed using a combination of Zoom and Happy Scribe technology and verified by GCB. Interviews administered in Haitian Creole were verified, translated and transcribed by GCB and a professional Haitian Creole translator; both are fluent in Haitian Creole.

### 2.2.3. Secondary and Archival Data

Secondary data comprised online articles and key archival program documents including organization webpages, photographs, email communications, development reports, and program marketing videos. Table 1 in Supplementary Information S1 summarizes the data sources utilized for the case study. Email communications included initial program scoping and development, and progress notes to executive team members and funders. The document archives included board meeting books, financial records, evaluation reports, newsletters, and progress notes. Photographs depicted field work, class sessions, and experimental plot progress. Except for program webpages and online articles, all secondary sources

of data were collected via email or in-person by GCB. Upon receipt of the secondary data sources, each item was briefly reviewed to confirm relevance and completeness, then categorized by resource type and scanned to create a digital copy if necessary.

## 2.3. Data Analysis

Focus group and interview transcripts were thematically coded with Dedoose using an *a priori* coding framework based on the Scaling Innovations Theoretical framework. The details of the coding framework can be found in Supplementary Information S3. All data were analyzed concurrently. In line with the coding manual for qualitative research (Saldaña 2009), the first round of coding focused on themes developed in the a priori coding framework. In the second round of coding, emergent themes and patterns from round one were applied. Preliminary findings from the focus groups and interviews were triangulated with program documents and archives—including Excel records of tree seedling distribution summaries and program newsletters— to corroborate participants' accounts. For example, if participants noted road construction as an important precursor to project success, there were images that could confirm this observation. All coded excerpts were exported by code to facilitate thematic analysis and synthesis in Word. GCB and SBA reviewed the coded data to identify and define emergent themes and illustrative key quotations. Inconsistencies in code applications and themes were discussed until consensus was reached.

## 2.4. Researcher Positionality

The lead author, GCB, is of Haitian descent. At the time of the study, our research team consisted of trained researchers in agroforestry, natural resources and social sciences, all located in the United States. All potential participants were informed of the research team members' motivations for conducting this study through the informed consent process; the motivations of the team were to learn about the facilitating factors and barriers to designing, implementing and scaling NRM projects.

# 3. Findings

## 3.1. Participant Characteristics and Departmental Representation

A total of 159 people were initially invited to participate in the research. Of those invited, a total of 48 (30%) provided informed consent and participated in the study. Table 1 summarizes the participant demographics.

Table 1
A summary of case study participant demographics who were interviewed between January and July 2023.

| **Demographic** | **n = 48** | **%** |
|---|---|---|
| *Nationality* | | |
| Haitian | 27 | 56 |
| Other | 21 | 44 |
| *Gender* | | |
| Cisgender female or woman | 11 | 23 |
| Cisgender male or man | 36 | 75 |
| Non-Binary | 1 | 2 |
| *Years of Experience* | | |
| 5 years | 2 | 4 |
| 6–9 years | 11 | 23 |
| 10–15 years | 18 | 38 |
| 16 + years | 17 | 35 |
| *Natural Resource Management Focus* | | |
| Agriculture & Land | 19 | 40 |
| Marine Conservation | 2 | 4 |
| Multiple | 27 | 56 |

All ten of Haiti's departments were represented in the sample of participants and secondary data. Most were from the Artibonite, and Ouest, or worked across multiple departments (see Fig. 3 in S1). This distribution reflects an in-depth exploration of embedded cases within the Artibonite and Ouest. The results are reported in three project phases: 1) planning and design, 2) piloting, and 3) scaling. The planning and design phase captured when projects were brainstormed and developed. During the piloting phase, projects were initiated, tested, and evaluated. In the scaling phase, projects became established and expanded by inviting new communities willing to engage in the proposed programming.

## 3.2. Planning and Design

Stakeholder engagement, adaptation to local context, collaboration, partnerships, and networks (all external factors) were key contributors to the successful planning and design of NRM programs across Haiti. Respondents from various areas of expertise emphasized that to successfully plan and design a project, a critical first step was building trust (a necessity for social capital). Table 2 presents a

collection of excerpts from various data sources that illustrate the critical factors in the planning and design phase.

Table 2

Illustrative quotes and their associated theme as it relates to contextual factors and their influence on natural resource management program planning and design.

| | | | |
|---|---|---|---|
| **Planning** | **External Factors** | **Project Factors** | **Organizational Factors** |
| | ***Individual Interview #14***<br><br>**Partnerships and Collaborations - "Before, we could do a project without partnerships. There are two reasons why you should collaborate now. A lot of places already have projects going on. When you go somewhere and a project is already being implemented, you should partner with them to create a symbiotic relationship and work together. What I'm doing can be complementary to what it is they are doing. We don't have to be doing the same thing."**<br><br>***Individual Interview #13***<br><br>**Adaptation to Local Context - "You have to become friends with people, learn about them, learn their culture, learn their way of life, and understand why they do what they do."** | ***Individual Interview #3***<br><br>**Technical Factors - "You can't just walk in and work in [rural] Haiti... Any project that is devised in your office in Miami, New York, or Port-au-Prince is going to fail."**<br><br>***Focus Group #1A***<br><br>**Performance Management Information - "There was this definite question at the beginning, like, are we going to want proof that people are planting on their own land. And are we going to want proof that people know they're doing this on land that they have a right to… and kind of realized that we had to go with informal tenure, where, with the community acknowledged that that was the land that that person occupied."** | ***Individual Interview #7***<br><br>**Time - "I don't think it was terribly difficult to plan and deal with stuff because we had margins for error...the [program] avoided a lot of that by being a little bit more modest in its ambition and more realistic about its timelines."**<br><br>***Individual Interview #24***<br><br>**Time - "[Planning] is a very difficult thing to do, and sometimes it takes a while to show results, but there *are* results."** |
| **Design** | *Individual Interview #21*<br><br>**Adaptation to Local Context -** "Each of these communities, even if they're all rural, they each have their own social climates. You have to be pragmatic. You talk to the locals first, you get to know them, then you move in on them."<br><br>*Focus Group #5*<br><br>**Partnerships and Collaborations** - "The Church represents a very stable institution and symbol in the communities… we facilitate a process for the local church to see themselves as an agent of change in something that they never | *Individual Interview #23*<br><br>**Technical Factors** - "Agroforestry depends on what is going on locally and what you try to build on that people are already doing to protect the environment and, also is productive in helping them to make a living. In other words, to get that lay of the land, you need to do some rapid assessment and, you need to do an inventory of who is doing what, where in the area that interests you."<br><br>*Individual Interview #22*<br><br>**Technical Factors** - "Haiti is like very heterogeneous | *Individual Interview #16*<br><br>**Time/ Financial Resources -** "You're going to pay us for two years to do the project, to do the actual activities, and then you want us to monitor and evaluate for three years after the project ends— with what? How am I going to pay my staff with that? So, a lot of what happens is that the timescales are unrealistic for certain activities in which you're trying to implement a change."<br><br>*Program Webpage #24* |

| | | | |
|---|---|---|---|
| | really did before…the church is a great ally for effectiveness and success…" | right. So, what grows in one part might not grow in another, even in one little area. The south facing side of the mountain might be dry, and then the north facing side of that same mountain might be wet." | **Stakeholder Engagement** - "Our model takes a tiered approach, starting small, and expanding over time. Throughout each stage of the process, [we] will be conducting meetings and surveys in the community…to inform community members of the project plan and goals, provide resources as needed, and to gather feedback. This will allow us to adapt our project to better fit community needs." |

Respondents specifically emphasized the importance of planning for prolonged periods of establishing rapport, learning cultures and norms, and understanding the complex realities of intended stakeholders. As a planning element, project implementers would include well-known and trusted community leaders in planning committees or meetings. Social capital-based groups, such as farmer associations and faith-based groups, for example, were engaged in both the planning and design of NRM projects in Haiti. The existing network ties amongst farmer associations and church groups within communities were strategic partners in planning since they could assist in conducting initial needs assessments and designing programs for the families in their communities who were bound by similar values. A tree planting program manager in focus group #4 described how churches were "*symbols of rural communities"* that made for great allies in planning and designing NRM programs to benefit their communities.

Adaptation to the local context, which consists of adapting to local norms and circumstances to ensure inclusivity, was perceived as a significant aspect of designing NRM programs. Respondents utilized early scoping assessments and integrated findings to NRM programming. For example, adaptations were made to ensure agroforestry systems incorporated culturally relevant species to align with existing agricultural practices that communities were implementing; this was facilitated using open community meetings where farmers were able to express their needs and aspirations for their plots (Focus group #1A). Individual interview #9 shared that, on occasion, the projects envisioned by external program implementers, may not align with the actual needs of the community despite being beneficial, in theory:

You need to know beforehand exactly what the locals' needs are…They might need some sort of infrastructure such as roads for access…Maybe it's a bridge that the kids have to cross to go to school that needs repairing…they would rather have something done about that instead…

Respondents also noted the importance of acknowledging land tenure arrangements, tree usage, knowledge of existing community projects, and livelihood drivers in the intended participant communities.

Collaborations and partnerships between various implementers were crucial in the planning phase. Respondents suggested that when planning, ample time should be spent assessing where programs in the servicing area already exist and learning about their implementation successes and failures. In designing a program, others recommended ensuring that it intentionally partners with public and private entities in the local area. In doing so, implementers would reduce their dependency on the nation's capital in Port-au-Prince, where most services were typically concentrated. An advantage of reducing dependencies on Haiti's capital city was that programs would be less impacted by political turmoil and subsequent violence and conflict that would disrupt operations.

Technical factors (a part of project factors) were emphasized as strategic elements of the planning and design of NRM programs (Table 2). When describing the importance of the local socio-ecological context, one participant emphasized:

*"While a project may have worked elsewhere, it did not evolve in Haiti. Any project not designed for Haiti… will have a lot of challenges succeeding"* (individual interview #24).

From an ecological perspective, another respondent noted how it was essential to design interventions in line with the landscape's agroecological zones (individual interview # 23). That thought extended into discussions on planning, during which the participant highlighted the need for *"getting a lay of the land"* and identifying regional and local level differences in the socio-ecological systems.

Lastly, time, which is an organizational factor that focuses on accurate forecasting and planning for intended results, was viewed as a key planning and design element for project success (Table 2). Development Report #2 from the Agricultural and Agroforestry Technological Innovation Program (PITAG) explicitly stated *"...in a fragile state like Haiti, the design process needs to be simple, and the main focus and most resources have to be dedicated to the implementation phase."* This implied that focus should be prioritized on allocating the resources to implement the program, rather than spending too much time and resources on designing a perfect program. This contrasted with what participants said about not rushing the planning and design phase and requiring ample time to ensure its suitability (Individual Interview #3, #13, #23). Further supporting the desire to plan strategically and efficiently, respondents described the negative outcomes of overly ambitious projects and the resulting need to factor in an appropriate margin of error for planned activities. For example, when describing the planning of a large smallholder farmer agricultural program implementation, a program manager said of a predominant United States development organization:

*"I forget what the targets [were] on that [project]. It was something absurd like triple the income of 45,000 smallholder farming households in five years. But it's a [organization name] project so, really three years, those sorts of things."* - individual interview #7

# 3.3. Piloting

Organizational factors (human and financial resources), project factors (technical factors), and external factors (collaboration, partnerships, and networks) influenced program success during the piloting

phase. Table 3 lists a collection of excerpts that illustrates the influence of the contextual factors on the piloting phase. The human resources factor, which considers an understanding and ability of what it takes to work within a project's constraints in the context of Haiti, was effective when the size of the program remained manageable. Respondents noted that when projects remained a manageable size, less time was spent on the management of people and meeting overly ambitious goals. Individual interview #7 continued to describe how their initiative was *"…sort of like a right-sized project for the implementation area…"* Financial resources were also critical, as indicated by several respondents from various sectors.

Table 3

A collection of illustrative quotes and their associated theme as it relates to contextual factors and their influence on natural resource management program piloting.

| | External Factors | Project Factors | Organizational Factors |
|---|---|---|---|
| **Piloting** | *Focus Group #1A*<br><br>**Collaboration, Partnerships, and Networks** - "We needed to work in the communities that had a good relationship with the long-standing hospital already. The hospital had made relationships and built trust with the local leaders that we were able to be introduced to and access."<br><br>*Individual Interview #23*<br><br>**Adaptation to Local Context -** "You probably don't start from the top down. You start from specific sites, where you can work at the grassroots level with local farmers. You can then scale that by working with organized grassroots organizations." | *Individual Interview #23*<br><br>**Technical Factors** - "…community outreach and agricultural outreach programs targeted local ravines. [The residents] used this labor system, that's common in rural Haiti, but in a new way…to treat the entire little micro catchment of the ravine. From the head to the foot and along the flanks of the ravine… And, and so, the farmers who were willing, who had land along the ravine, and who had a vested interest,…were willing to work together..."<br><br>*Individual Interview #21*<br><br>**Performance management information** - "The reason we're working on watershed, but more importantly sub watershed levels is because USAID has realized that you can't work on a very broad level, especially on a five-year, 50-million-dollar project. The resources and the time just aren't there. So, by working on a sub watershed, you're actually getting something done somewhere. And what you're really doing is you're showing people, wow, that can actually be done. I mean, you can't work on a completely national level. So you say, oh we'll work on a departmental level. No.. that is all messed up, so let's work on a commune level. No, that's still too big. So finally, you work on seven square feet and you actually get it done…even if it's only on seven square feet." | *Focus Group #1B*<br><br>**Financial Resources** - "We weren't committed to a grant that was very strict. Luckily, we had this amazing kind of flexible funding at the start.…We were lucky that a lot of our funders we're not, you know, like these huge grants, whether it's tons of reporting, you have to do, you know, these specific metrics, and they have their objectives, and we have what we want to achieve. We had more private [donors] that we're believing in our mission and our vision. That was what actually made for [the project] to be quite successful..."<br><br>*Focus Group #3*<br><br>**Financial Resources** - "[The project] started self-funded, as in my 401K and my savings…if we were waiting for [government funding] we wouldn't be here today."<br><br>*Focus Group #5*<br><br>**Human Resources** - "… working with USAID requires a lot of resources. It's a career in itself! Just managing the project is a career in itself."<br><br>*Individual Interview #25*<br><br>**Financial Resources** - "I started the [initiative] with less than USD $50.00. I did not have any money to buy anything…it was the passion and the vision and the desire to do something different in Haiti that really |

| | | |
|---|---|---|
| | | motivated and pushed me to do something."<br><br>*Individual Interview #5*<br><br>**Financial Resources** - "…[when] half [of the funding] is going towards just getting the structure in place…you are complicit in the ineffective aid being dispersed in Haiti…. I was the [high level role redacted] for four years." |

Respondents noted how unrestricted *"flexible"* funding was more advantageous in the pilot phase (Table 3). They also described how, in the absence of large grants, personal funds allowed them to get an initiative started. For example, an agroforestry practitioner with a cacao business stated that his organization's founders *"…were using [their] personal funds"* for program activities in its initial two years (individual interview #21). Using personal funds can provide the flexibility and influx of funds necessary to pilot projects, but can come at great personal expense, as one interviewee noted having to withdraw from their retirement to fund an NRM project (Table 3).

As a project factor, technical factors during the piloting phase included strategic implementation of programs in areas where landscape characteristics were favorable to the NRM practice of interest. Favorable landscape characteristics included productive microclimates, access to roads, access to irrigation, and other local infrastructure. Respondents who managed multi-site projects noted the advantages of operating at the watershed level. The watershed was described by program implementers as "*a region defined by rivers and streams that all flow into a common larger body of water"* (program webpage #18), where benefits from high elevations can *"trickle down"* (individual interview #23) to lower elevation communities. Successful piloting also leveraged external factors such as strategic partnerships and collaborations with long-standing trusted institutions such as churches, hospitals, and grassroots organizations. Respondents described how these institutions had good relations with communities and could reduce participant hesitancy and project redundancy (Table 3), further demonstrating the importance of partnerships in all phases of NRM projects.

## 3.4. Scaling

Organizational factors (financial and human resources, and leadership), as well as project factors (performance management information), played important roles in the scaling phase. Table 4 provides a collection of illustrative quotes related to the scaling phase. Relative to financial and human resources, respondents noted that secure sources of funding and ample staff were necessary to intake new communities in their program. During focus group #1b, an agroforestry program manager shared, *"we had to kind of regroup and figure out how to still be successful, and not lose, the faith and interest [of communities] and hope from our staff."* This was a response to a significant loss of grant funding that had supported their program's pilot years. The program, which had been operating in over 60 communities,

had to scale down to 30 communities. Relative to human resources, successfully scaling demanded that staff could manage newly recruited communities in NRM programs. A manager of a soil composting social enterprise also emphasized the importance of ensuring adequate human resources when thinking about scaling; they were unable to expand to other areas without the right people with established community relationships in place (Table 4).

Leadership was an essential part of the scaling of NRM programs. Local leaders who live in and around the participant communities were instrumental in program launch, spread, and sustainability. During a focus group (#2b), one community development professional shared their appreciation for the organization's local leader:

He's a great leader. They've gone through several hurricanes. They've gone through the pandemic. They've gone through the assassination of the president. There was no commuting to Petit Goâve for a while. All throughout these events, he's been really that steady leader that always finds a way to bring the community together. They have such a high level of respect for him that they follow right? They listen to him.

The *"highly regarded"* and *"dedicated"* (focus group #2b; program webpage #24) leaders were often engaged in many aspects of community development. For instance, one leader not only managed the agriculture program, but he also a gardening school, demonstrating the central role that local leaders play within their communities (focus group #2a).

Table 4
A collection of illustrative quotes and their associated theme as it relates to contextual factors and their influence on natural resource management program scaling.

| | Organizational Factors | Project Factors |
|---|---|---|
| **Scaling** | *Individual Interview #2*<br><br>**Performance Management Information** - "…if [the community] finds that a particular crop doesn't produce the food how they want it to be produced, they can make a request for other types of seeds. We do the evaluation and if people are in agreement, we make the exchange for them to get other seeds that are better suited for their needs and land productivity."<br><br>*Individual Interview #15*<br><br>**Performance Management Information** - "We're doing exit surveys at the site. We're calling people afterwards to see how they're using [the service]…we are trying to become more responsive to that information as it comes in, and to adapt and change based on what we're learning. Since we are working mainly with public funds on grant cycles, it's hard you know, to make the changes on that timeline. It's a cumbersome process to say...Donors are not set up for that." | *Focus Group #1A*<br><br>**Financial Resources** - "So much of the grants were unrestricted…we had very few funds that had specific additional deviations requested from them. The local leaders of the local communities were the most essential piece of the success."<br><br>*Individual Interview #6*<br><br>**Human Resources** - "I think there's always this pressure and desire for scalability. And I think that there's scalability, including replication in the international development space. And I think that something that that pressure often misses is the importance of human resources and human capacity and how much that is relational to operating in Haiti, and how important it is to have quality relationships in a local area in order to do the work that you want to do."<br><br>*Individual Interview #7*<br><br>**Leadership** - "…if we actually want ten communities, if the goal is to expand… I'm telling [the manager] I need the resources to hire two more people so that I can responsibly handle this volume.<br><br>**Risk Disposition** - [The program] was never working at the [large] scale, which I think is an advantage. It's sort of like a right sized project for the implementation area…"<br><br>*Individual Interview #4*<br><br>**Leadership -** "…you would go to the *Kazek* (local authority closer to the local population). Then they would [introduce you to] the leaders in the community who can guide the program." |

Performance management information, which included monitoring and evaluation activities, was perceived as important in the scaling phase due to the increase in staff and number of participating members, which required more reporting, management, and continual learning and improvement (Table 4). For a community-based NRM program with more than 15 years of operational experience, it was evident that evaluations were essential to not only scaling their operations but also sustaining it:

*"We recently launched a comprehensive program evaluation to generate a detailed plan…Since 2006, we have developed a successful model… but as we continue to sustain that model—taking on new communities each year and progressively "graduating" old ones—it is time to look to the emerging needs of our communities, needs like shade-tolerant crops and (eventually) timber harvesting and marketing methods."* - program webpage #1

# 4. Discussion

This study aimed to advance our understanding of how contextual factors contribute to NRM program success by identifying the most critical factors associated with successful planning, designing, piloting, and scaling across Haiti. Organizations were tasked with creating the conditions that could enable adoption and scaling of their innovations (e.g., leveraging social capital-based groups, engaging in road development, introducing innovations that match agroecological zones). Relative to planning and design, across all professional backgrounds, external factors such as stakeholder engagement, collaborations, partnerships, and networks were perceived as essential in the planning and design phase. This was observed by organizations tapping into existing social capital-based groups to build rapport and identify needs, cultural norms, and existing programs. This finding is in line with prior research that associates social factors, stakeholder engagement, cultures, norms, and interactions among people, including those in the private and public sectors, with positive NRM outcomes (Brooks et al. 2012; Buck et al. 2020; Catalano et al. 2019; Mahajan et al. 2021; Muilerman and Vellema 2017).

The research also found that interventions were successful when designed to match agroecological zones and land arrangements, which sheds light on the importance of specially tailored interventions across the landscape. This finding lends support to prior research in Brazil emphasizing compatibility with environmental context (Mills et al. 2019; Joglekar et al. 2025) as well as research demonstrating the effects of social-ecological contexts on the adoption of policies and practices (Mills et al. 2019). The insight builds on Brooks and colleagues (2012), who also found that supporting local traditions around land tenure was a good strategy for project success in difficult contexts.

Relative to the piloting phase, respondents described how the technical design of NRM programs should consider landscape characteristics for piloting, emphasizing the need to tackle all levels of a watershed. Our findings, therefore, also build on Fischer and Levy (2012), who found the watershed-level implementation to produce effective results. We also found that designing NRM programs at the watershed management level covers dispersed landholdings while following rules set out by community members. It was unsurprising that external factors continued to be an important factor contributing to program success in the piloting phase. In line with earlier research in Haiti (Blaise et al. 2024; Murray and Bannister 2004), respondents described how strategic partnerships and collaborations with trusted institutions and pre-existing social groups also contributed to the success of program pilots. Until communities could trust external actors, NRM practitioners had to rely on their connections with trusted actors within communities.

Respondents also perceived human and financial resources as key success factors in piloting NRM programs. Relative to human resources, local leaders were instrumental in the pilot phase. By empowering leaders to be community champions and removing the barriers that hindered localized development, NRM programs were successful at attracting and sustaining participants who were influenced by the local leaders. NRM program staff were also encouraged to build their capacity to self-manage beyond the pilot phase, a finding that had also been drawn in previous scaling and program evaluation research (Battista et al. 2017; Catalano et al. 2019; Mahajan et al. 2021). Lastly, a pilot was successful when funding resources were flexible and when programs were not limited by extensive project reporting requirements of donors. Programs that did not have the burden of extensive reporting to donors were capable of exclusively focusing on their program's activities and needs. This finding elucidates the need for manageable expectations from donors, ultimately reducing the burdens that Fengler and Kharas (2010) found among senior staff who were allocating more than half of their time to fulfill donor requests.

Organizational factors such as financial and human resources, time, and leadership were key elements for success in the scaling phase. As NRM programs scaled, the demand for financial and human resources also increased to maintain them. This demand for increased financial and human resources illustrates the importance of adequate program staff and operational budgets in the early stages of program development, even as programs scale. These findings align with previous research that underscores the considerable financial and human resources required to scale an innovation (Battista et al. 2017). Also in line with Battista et al. (2017), we found evidence to support the notion that scaling is not an isolated event that initiates at the end of the pilot phase. Instead, it is a continuation of earlier stages that are adapted to accommodate the needs of new people and places. While information can spread between isolated mountain communities who wish to participate in NRM programs (Blaise et al. 2024), we show that a considerable amount of planning and adaptation is necessary due to the logistical and infrastructural barriers in the rural landscape.

Despite having relatively more resources than smaller-scale programs, the large-scale, top-down programs described by participants were perceived as impractical and tough to manage in the context of Haiti. When it comes to time, which is an organizational factor that focuses on accurate time forecasting and planning for intended results, this study found large scale scaling goals were often unsuccessful due to the delays and lack of human and financial resources to effectively meet ambitious NRM goals. This illustrates a common pitfall described in the scaling literature regarding the operational limitations of achieving ambitious targets in a short timeframe for the number of program participants or adopters (Pienkowski et al. 2024). Such targets may not be sustainable in practice due to the resource demands that arise after the conclusion of a pilot phase (Woltering et al. 2019). Despite this time challenge, some programs successfully managed their growth by investing in localized leadership that remained constant, even in the face of resource limitations and political instability.

Respondents across various professions described how, in the absence of funding and other programmatic difficulties, dedicated local leaders played a crucial role in ensuring the successful

implementation of a project. This finding on the critical role of community leaders for the scaling process, a topic previously explored in Kenya's and Tanzania's experience with community based NRM (Fidler et al. 2024) and in Fiji's experience with indigenous-led NRM (Jagadish et al. 2024) fills the recent Haiti literature gap. Although collaboration with government has been shown to be impactful for NRM scaling in Mexico (Romero-de-Diego et al. 2021) Tanzania (Johansson et al. 2013), this study did not find a meaningful role of government collaborations at the scaling phase, suggesting a preference for localized approaches to scaling that could cross municipal boundaries. Although the Interministerial Committee for Land Planning (CIAT) was discussed positively in one interview, it was surprising that the National Institute of Agrarian Reform (INARA), which oversees agricultural land distribution, rural property redistribution, and agrarian reform was absent from participant responses.

# 5. Limitations

Several limitations are worth noting when interpreting the findings. This study took place throughout a period characterized by socio-political instability within Haiti and the 2019–2023 global COVID pandemic. This period therefore did not allow for in-person field observations. Relative to the instability within the country, this also meant that potential participants were not available. Secondly, due to the nature of the embedded case study, the data was concentrated in the Artibonite and Ouest Departments, thus our results reflect those regions. Third, despite Haiti having one of the longest coastlines in the Caribbean, only two marine professionals were interviewed. This is due to the limited focus on marine and atmospheric programming and policies in Haiti. Lastly, given the time and funding constraints of the study and rurality challenges, it was impossible to access all grassroots organizations. Despite these limitations, our work is the first of its kind to conduct an in-depth investigation of NRM implementation success in Haiti in recent years and advances the innovation scaling literature.

# 6. Conclusions and Policy Implications

This research makes two contributions to the NRM and scaling literature. First, it synthesizes how NRM programs with varying years of experience in Haiti have implemented NRM initiatives and adapted to Haiti's context over decades. Second, this research is the first to utilize the relatively new SITF in a novel context to understand the mechanisms driving program scaling amid the various challenges in Haiti. Thus, this study's contributions set the stage for future research that can investigate the theoretical framework's factors across other rural contexts facing national fragility, establishing greater consilience of the scaling process across the globe. Within Haiti, future research can focus on department-level outcomes given the variations in culture, agricultural profiles, governance frameworks, and social norms that exist across the country's diverse departments.

Funding remains critical to supporting NRM innovations in Haiti. Implementers should seek flexible seed capital through grants and donations with limited reporting and impact obligations to allow for adaptive management. Similarly, large donors should simplify reporting requirements so that smaller organizations can access larger funding pools without the burden of complicated reporting likely to take

time and resources away from implementation. Implementers should also secure adequate financial and human resources to support the program if scaling is the goal, even if the context may, seem inconducive to scaling success.

Finally, when programs are devised, piloted, and evolved in Haiti at a modest scale, they are better positioned to move beyond the pilot and avoid pitfalls at scale. This contextualized approach to implementation facilitates learning and adaptation while balancing the urgent needs of communities, ultimately supporting well-informed decisions for program success. Therefore, to achieve sustainable global development, we must obtain a deeper understanding of contextual factors. With knowledge on how these factors influence scaling outcomes, we can successfully plan, design, pilot, and scale innovations despite the challenges associated with national fragility.

## Declarations

# Conflict of Interest Statement.

The authors declare that they have no conflict of interest.

**Ethical approval and consent to participate.**

This study was conducted in accordance with the Declaration of Helsinki's principles and the Common Rule (2018 Requirements). The approved research protocol was reviewed by the Cornell University Internal Review Board's Office of Research Integrity and Assurance and did not meet the definition of "human subjects research" (Protocol IRB# 0146791). The authors confirm that informed consent was obtained from all participants prior to their participation in the study. Participants reviewed and signed an informed consent form informing them of the voluntary nature of their participation, privacy protocols, data management protocols, and how the results of the study would be used.

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# Data availability.

Due to ethical restrictions and participant confidentiality, the transcripts and organization names cannot be shared publicly. The data contain potentially identifiable information that cannot be fully anonymized. A list of all analyzed online articles and program webpages are available upon request from the corresponding author. No quantitative datasets were generated or analyzed during the current study.

# References


1. Bannister ME, Josiah SJ (1993) Agroforestry Training and Extension: The Experience from Haiti. Agroforest Syst 23(2–3):2–3. https://doi.org/https://doi.org/10.1007/BF00704918
2. Battista W, Tourgee A, Wu C, and Rod Fujita (2017) How to Achieve Conservation Outcomes at Scale: An Evaluation of Scaling Principles. Front Mar Sci 3. https://doi.org/10.3389/fmars.2016.00278
3. Bayard B, Curtis M, Jolly DA, Shannon (2004) and others. *Adoption and Management of Alley Cropping in Haiti*. Technical Bulletin No. 2004-02. USAID
4. Benjaminsen TA, Mara J, Goldman, Maya Y, Minwary, and Faustin P. Maganga (2013) Wildlife Management in Tanzania: State Control, Rent Seeking and Community Resistance. Dev Change 44(5):1087–1109. https://doi.org/10.1111/dech.12055
5. Binod B (2017) Community Forest and Forest Management in Nepal. Am J Environ Prot 4(3):79–91. https://doi.org/10.12691/env-4-3-3
6. Blaise GC, Allred SB (2021) Trees for Livelihoods: Exploring the Relationship between Community Agroforestry and Community Capitals in Rural Haiti. Community Dev 0(0):1–22. https://doi.org/10.1080/15575330.2021.1998168
7. Blaise GC, Shorna B, Allred SJ, Morreale et al (2024) Exploring the Scalability and Sustainability of Community-Based Agroforestry to Achieve Planetary Health Benefits in Haiti's Lower Artibonite Valley. PLOS Clim 3(10):e0000406. https://doi.org/10.1371/journal.pclm.0000406
8. Breaugh J, McBride K, Kleinaltenkamp M, Hammerschmid G (2021) Beyond Diffusion: A Systematic Literature Review of Innovation Scaling. Sustainability 13(24):24. https://doi.org/10.3390/su132413528
9. Brooks JS, Kerry A, Waylen (2012) and Monique Borgerhoff Mulder. How National Context, Project Design, and Local Community Characteristics Influence Success in Community-Based Conservation Projects. *Proceedings of the National Academy of Sciences*109 (52): 21265–70. https://doi.org/10.1073/pnas.1207141110
10. Buck L, Scherr S, Trujillo L, Mecham J, Fleming M (2020) Using Integrated Landscape Management to Scale Agroforestry: Examples from Ecuador. Sustain Sci 15(5):1401–1415. https://doi.org/10.1007/s11625-020-00839-1
11. Catalano AS, Lyons-White J, Mills MM, and Andrew T. Knight (2019) Learning from Published Project Failures in Conservation. Biol Conserv 238:108223. https://doi.org/10.1016/j.biocon.2019.108223

12. Chandy L, Linn JF (2011) *Taking Development Activities to Scale in Fragile and Low Capacity Environments*. 93
13. Coello B, Oseni G, Savrimootoo T, Weiss E (2014) and others. *Rural Development in Haiti*. World Bank. https://www.academia.edu/70907227/Rural_development_in_Haiti_challenges_and_opportunities
14. Crawford A, Dazé A, Hammill A Jo-Ellen Parry, and Alicia Natalia Zamudio. 2015. *Promoting Climate-Resilient Peacebuilding in Fragile States*
15. Eckstein D, Künzel V, Schäfer L (2021) and Germanwatch. *Global Climate Risk Index 2021 Who Suffers Most Extreme Weather Events? Weather-Related Loss Events in 2019 and 2000–2019*
16. Etienne (1997) Haïti: The Invasion of NGOs, vol 327. Editions du CIDIHCA
17. Fengler W, and Homi J. Kharas (2010) Delivering Aid Differently: Lessons from the Field. Bloomsbury Publishing PLC
18. Fidler RY, Shauna L, Mahajan L, Ojwang et al (2024) Individual and Community Empowerment Improve Resource Users' Perceptions of Community-Based Conservation Effectiveness in Kenya and Tanzania. PLoS ONE 19(4):e0301345. https://doi.org/10.1371/journal.pone.0301345
19. Fischer A, Levy MA (2012) Designing Environmental Restoration Programs in Politically Fragile States: Lessons from Haiti. In *Strengthening Post-Conflict Security and Diplomacy*, edited by Carl Bruch, Mikiyasu Nakayama, and Ilana Coyle. Environmental Law Institute
20. Franzel S, Denning GL, Lillesø JPB, Mercado AR (2004) Scaling up the Impact of Agroforestry: Lessons from Three Sites in Africa and Asia. Agroforest Syst 61(1):329–344. https://doi.org/10.1023/B:AGFO.0000029008.71743.2d
21. IHSI (2024) *Disaggregated Estimates of the Haitian Population in 2024*. Haitian Institute of Statistics and Informatics (IHSI). https://docs.haitidocs.org/ihsi-2024-disaggregated-estimates.pdf
22. Jagadish A, Freni-Sterrantino A, He Y et al (2024) Scaling Indigenous-Led Natural Resource Management. Glob Environ Change 84:102799. https://doi.org/10.1016/j.gloenvcha.2024.102799
23. Jagadish A, Mills M, Mascia MB (2021) *Catalyzing Conservation at Scale: A Practitioner's Handbook (Version 0.1)*
24. Joglekar A, Arundhati Jagadish CB, Jardim et al (2025) Landholders' Engagement in Restoring Brazil's Atlantic Forest Is Linked with Livelihood Compatibility and Legal Compliance. Int Forestry Rev 27(1):40–52. https://doi.org/10.1505/146554825840449579
25. Johansson KE, Axelsson R, Kimanzu N, Sassi S, Bwana E, Otsyina R (2013) The Pattern and Process of Adoption and Scaling up: Variation in Project Outcome Reveals the Importance of Multilevel Collaboration in Agroforestry Development. Sustainability 5(12):12
26. Kolstad I, and Tina Søreide (2009) Corruption in Natural Resource Management: Implications for Policy Makers. Resour Policy 34(4):214–226. https://doi.org/10.1016/j.resourpol.2009.05.001
27. Larson AM, and Fernanda Soto (2008) Decentralization of Natural Resource Governance Regimes. Annu Rev Environ Resour 33:213–239. https://doi.org/10.1146/annurev.environ.33.020607.095522

28. Mahajan SL, Jagadish A, Glew L et al (2021) A Theory-Based Framework for Understanding the Establishment, Persistence, and Diffusion of Community-Based Conservation. Conserv Sci Pract 3(1):e299. https://doi.org/10.1111/csp2.299
29. Mascia MB, and Morena Mills (2018) When Conservation Goes Viral: The Diffusion of Innovative Biodiversity Conservation Policies and Practices. Conserv Lett 11(3):e12442. https://doi.org/10.1111/conl.12442
30. Mills M, Bode M, Mascia MB et al (2019) How Conservation Initiatives Go to Scale. Nat Sustain 2(10):10. https://doi.org/10.1038/s41893-019-0384-1
31. Mohammed UK, and Nicola Favretto (2025) Livelihood Diversification among Women Farmers in Nigeria's Flood-Resilient Drylands. Clim Risk Manage 48:100708. https://doi.org/10.1016/j.crm.2025.100708
32. Moore M-L, Riddell D, Vocisano D (2015) Scaling Out, Scaling Up, Scaling Deep: Strategies of Non-Profits in Advancing Systemic Social Innovation. The J Corp Citizenship no 58:67–84
33. Muilerman S, and Sietze Vellema (2017) Scaling Service Delivery in a Failed State: Cocoa Smallholders, Farmer Field Schools, Persistent Bureaucrats and Institutional Work in Côte d'Ivoire. Int J Agric Sustain 15(1):83–98. https://doi.org/10.1080/14735903.2016.1246274
34. Muilerman S, Wigboldus S, Leeuwis C (2018) Scaling and Institutionalization within Agricultural Innovation Systems: The Case of Cocoa Farmer Field Schools in Cameroon. Int J Agric Sustain 16(2):167–186. https://doi.org/10.1080/14735903.2018.1440469
35. Murray GF, Bannister ME (2004) Peasants, Agroforesters, and Anthropologists: A 20-Year Venture in Income-Generating Trees and Hedgerows in Haiti. Agroforest Syst 61(1–3):1–3. https://doi.org/doi.org/10.1023/B:AGFO.0000029012.28818.0c
36. Nicol P (2020) Pathways to Scaling Agroecology in the City Region: Scaling out, Scaling up and Scaling Deep through Community-Led Trade. Sustainability 12(19):7842. https://doi.org/10.3390/su12197842
37. OECD (2025) States of Fragility 2025. *States of Fragility*2025 (February). https://doi.org/10.1787/81982370-en
38. Pienkowski T, Jagadish A, Battista W et al (2024) Five Lessons for Avoiding Failure When Scaling in Conservation. Nat Ecol Evol 8(10):1804–1814. https://doi.org/10.1038/s41559-024-02507-4
39. Ribot JC, Agrawal A (2006) and Anne M. Larson. Recentralizing While Decentralizing: How National Governments Reappropriate Forest Resources. *World Development*, Rescaling Governance and the Impacts of Political and Environmental Decentralization, vol. 34 (11): 1864–86. https://doi.org/10.1016/j.worlddev.2005.11.020
40. Rogers E (1995) *Diffusion of Innovations, 4th Edition*. Free Press. https://books.google.com/books?id=v1ii4QsB7jIC
41. Rogers E (2003) Diffusion of Innovations. 5th Edn New York, NY. Simon & Schuster, Inc.
42. Romero-de-Diego C, Dean A, Jagadish A, Witt B, Mascia MB, and Morena Mills (2021) Drivers of Adoption and Spread of Wildlife Management Initiatives in Mexico. Conserv Sci Pract 3(7):e438.

https://doi.org/10.1111/csp2.438

43. Scholz R (2002) and Olaf Tietje. *Embedded Case Study Methods*. By pages 9–14. SAGE Publications, Inc. https://doi.org/10.4135/9781412984027
44. Smucker GR, Joël T (1995) *Impact of Tree Planting in Haiti: 1982–1995*. No. 23. Haiti Productive Land Use Systems Project, no. 23. Auburn University Libraries. https://aurora.auburn.edu//handle/11200/49587
45. Sprenkle S (2008) Community-Based Agroforestry as Restoration: The Haiti Timber Reintroduction Project Methods and Framework. Ecol Restor 26(3):3. https://doi.org/doi:10.3368/er.26.3.201
46. Tarter A (2010) Thirty Years after a Tree-Planting Project: A Political Ecology Perspective on Behavior and Land Changes in Rural Haiti. Masters Arts Univ Fla. https://ufdc.ufl.edu/UFE0041653/00001
47. Westermann O, Förch W, Thornton P, Körner J, Cramer L, Campbell B (2018) Scaling up Agricultural Interventions: Case Studies of Climate-Smart Agriculture. Agric Syst 165:283–293. https://doi.org/10.1016/j.agsy.2018.07.007
48. Woltering L, Fehlenberg K, Gerard B, Ubels J, Cooley L (2019) Scaling – from 'Reaching Many' to Sustainable Systems Change at Scale: A Critical Shift in Mindset. Agric Syst 176(November):102652. https://doi.org/10.1016/j.agsy.2019.102652

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