

Rehabilitating Goldenberry Production in the Ecuadorian Andes With Regenerative Agriculture



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Investigating inclusive systems innovation

Massachusetts Institute of Technology



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MIT Local Innovation Group

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1. Introduction

In the summer of 2020, Marcelo Gordon, a smallholder farmer in San José de Minas, a rural town in the foothills of the Ecuadorian Andes, found himself hitting rock bottom. In the past few months, an emergent plant disease called *mancha morada* had quickly spread through his goldenberry fields, causing him to lose all 2,200 goldenberry plants on his farm. In his early 50s and the father of two children, Marcelo had been working in agriculture his entire life, and goldenberries had become the main source of income for his family in the past few years. Marcelo and his wife had been producers of organic goldenberries since 2016 and had been doing comparatively well during the past few years—they were harvesting and selling goldenberries on a weekly basis and earning regular income from the crop.

Marcelo was a member of the farmer association Asociación de Productores Agropecuarios de Ruta Escondida (hereafter referred to simply as Ruta Escondida), and his harvests were sold directly to Terrafertil, an Ecuadorian natural foods company that is one of the largest producers of goldenberries in the world. However, the new disease was killing the goldenberry plants before they could start producing. Once the purple spots started to appear on the plants' leaves (hence the colloquial name *mancha morada* or *punta morada*), it was impossible to slow the spread of the disease, and most of the plants in a field would die within a few weeks. By early 2020, the goldenberry farmers who belonged to the Ruta Escondida association had lost between 60% and 100% of their production capacity.

With their supply chain under direct threat, Terrafertil started to send lab test requests to universities and

governmental research institutions to try to identify an effective way to combat the novel and quickly moving disease. This coincided with the initial phases of the coronavirus pandemic, during which Ecuador faced one of the worst public health crises in the Americas, combining challenges to people's health with challenges to their livelihoods and the health of their plants. "*Mancha morada* was a huge blow to the goldenberry, just like COVID was to humanity," said José Miño, technical manager at Terrafertil.¹

Seeing *mancha morada* appear in his most recently planted plot of 300 seedlings, and lacking an effective strategy to combat the disease, Marcelo lost hope that he could recover his plants. He notified the company that he was planning to remove the plants in 15 days and abandon goldenberry production, even though it had been a major source of income for his family over the last several years.² Like Marcelo, other farmers in the area who had started cultivating goldenberries between 2017 and 2020 were also considering abandoning goldenberry production and switching back to more traditional crops, such as corn, potatoes, and beans, even though they generated lower and less stable incomes.³

As the disease spread rapidly through the communities, decimating goldenberry plants—and as farmers started to choose not to plant new rounds of seedlings—goldenberry production plummeted. Prior to the outbreak, Terrafertil was sourcing 15 tons of goldenberries per week from farmer associations throughout the area, but according to José Miño, this quantity dropped to just one ton a week once *mancha morada* was full-blown in 2020. Over the past several years, many local farmers had switched their fields from traditional crops

1. Co-author interview with José Miño, May 18, 2022.

2. Co-author interview with M. Gordon, April 18, 2022.

3. Co-authors interview with Narcisa Puma, April 6, 2022.

to goldenberry production since it was more lucrative, but now, with their plants dying, they were left without an income source. Compounding matters, many did not have sufficient cash on hand to invest in inputs such as organic fertilizers and insecticides needed to combat the disease.⁴

Yet in the span of a year and a half, through a multis-takeholder local innovation process, farmers from these communities were able to develop and implement effective methods of controlling this unfamiliar disease. As a result of that process, in 2021, they were able to regain 90% of their previous production levels and earn triple the revenue they earned in 2020 when their fields were affected by *mancha morada*. The following case study describes this local innovation process, detailing how regenerative agriculture practices were developed and jointly implemented and refined with farmers, how these practices were adopted and spread to neighboring communities, and how the positive initial results of this process stimulated additional, complementary supply chain innovations that contributed to the communities' ability to recover from *mancha morada*.

1.1 Research methods

This case study forms part of a series of case studies describing processes of inclusive local systems innovation for the research study, Investigating Inclusive Systems Innovation. Cases included in this series are selected according to criteria described in Hoffecker (2021), summarized below, and are researched using qualitative case study design as described in Yin (2018). Following work by Yin (2018) and Maxwell (2005), we treated cases in the series as single cases, and our objective is to understand each case as fully as possible within its own context to gain a nuanced understanding of the causal dynamics within each case.

To identify this case study, we engaged in a preliminary round of desk research in which we identified 61

4. Co-author interview with Wain Collen, April 5, 2022.

potential cases from around the world that, based on preliminary descriptions of the cases by other sources, appeared to meet the criteria for inclusive local systems innovation described in Hoffecker (2021). Our research team then screened these cases by conducting additional desk research to determine the extent to which each case appeared to be a successful example of local innovation that was multistakeholder and inclusive as well as operating at the local system level, which were our key criteria for inclusion. To gain insights into the model developed by Hoffecker (2021), our research team further narrowed the list of cases that emerged from that screening process to cases of inclusive local systems innovation within agricultural systems in the Global South. That process resulted in a short list of four cases, from which we chose this case as the most promising and logistically feasible after conducting scoping interviews with the respective case holders.

Once the case was selected, we identified interviewees from each of the key stakeholder groups that played a role in the co-development of the local innovation process. When identifying interviewees, we prioritized interviewees who had been engaged throughout the innovation process and therefore had knowledge of the process from its beginning to its current phase. We also prioritized identifying interviewees who could describe the process from distinct points of view and who could engage with our research team remotely over Zoom or WhatsApp calls. Due to a variety of constraints, we were not able to travel to conduct interviews, so we needed to be able to conduct all interviews and related research remotely.

Through this process, we identified nine potential interviewees, of whom eight were available to participate in interviews during the time allocated for data collection (see Appendix A). We conducted interviews remotely using the Zoom conferencing platform or as telephone calls over WhatsApp, and

typically each interview lasted between 30 and 60 minutes. We primarily conducted interviews in Spanish, with transcripts produced in Spanish and then translated into English by the research team. In cases where interviewees spoke English, we conducted interviews in English and produced detailed notes in English.

Following the initial round of interviews, we contacted several interviewees for follow-up conversations or to provide additional information over email where the research team identified that we needed further clarifications. In keeping with the principles of lean research as described in Hoffecker, Leith, and Wilson (2015) and Krystalli et al. (2021), we shared a draft of our case study write-up with those interviewees who were comfortable reviewing it in English in order to validate the accuracy of details in the case and to obtain their feedback.

1.2 Organization of the case study

This case study narrates the innovation process involved in co-developing a successful prevention and treatment protocol for the control of *mancha morada* in goldenberries following a chronological timeline developed during the data analysis stage. Chapter 2 describes the local context of the case, including background on the communities featured in the case and how these communities came to rely on goldenberry production for their primary income source. This chapter also describes the arrival of *mancha morada* to the region and the severity of the livelihood threat that it represented to farmers in these communities. Chapter 2 concludes by previewing the impressive results that these communities

were able to achieve in the span of under two years through the innovation process described in the subsequent chapter.

Chapter 3 describes the innovation process in depth, following the chronology of the case as described by our interviewees. This chapter narrates key developments in the innovation process in as much detail as we had available, focusing particular attention on turning points in the case timeline and events or interventions that contributed to bringing about the results described in Chapter 4. Chapter 4 picks up toward the end of the case timeline and describes the range of results starting to emerge from the case, which extend beyond the recuperation of goldenberry production and associated recovery in incomes to additional impacts connected to this innovation process.

Areas of impact described in Chapter 4 include impacts related to the spread of regenerative agriculture techniques, such as improved soil fertility and diversification of agricultural production (and resulting health benefits), as well as impacts related to the strengthening of farmers' capacity to be proactive and innovate. In this latter area, we describe a supply chain innovation proposed and developed by the farmers to create a "bioeconomy business" that is now providing a local source of supply for the organic inputs that farmers need to continue implementing the regenerative agriculture protocols that enabled them to control *mancha morada*. In Chapter 5, we conclude with analysis and reflections on key factors that contributed to the successful results described in Chapters 3 and 4 and the implications of these for actors interested in catalyzing and supporting inclusive systems innovation processes at the local level.

2. A livelihood threat for la Ruta Escondida's smallholder farmers

"It's called la Ruta Escondida ["hidden route"] because when you arrive, it's as if there were nothing there... but when you enter you find several parishes of the canton of Quito, in the province of Pichincha."

– Interview with José Miño, May 18, 2022

Less than two hours to the north of Quito, Ecuador's capital, lies San José de Minas, a small town in the mountainous northeastern corner of the province of Pichincha. This town, and nearby ones such as Atahualpa and Chavezpamba, sit approximately 8,000 feet above sea level, nestled into rolling hillsides and valleys carved out from the skirts of the towering Andes, which rise to peaks of 15,000 feet and higher in nearby areas. Traditional forms of work for residents of these communities have included laboring on large flower plantations or as smallholder farmers, forms of livelihood that are both risky and difficult, and which traditionally have not paid well.

Prior to starting goldenberry production, Marcelo Gordon had earned a living in these ways. Lacking a plot of land of his own and having only completed primary education, Marcelo spent 15 years working on a flower plantation, where through hard work and diligence, he rose to a supervisory position. The operation was chemical-intensive, and due to growing health concerns, after nine years he chose to quit his job and start organic farming instead. Like many smallholder farmers in the region, he focused on traditional crops including beans, peas, corn, and potatoes, which grew well in the mountainous soils but lacked both a stable source of market demand and stable prices.

Given the volatility of his farming income, and the need to support his wife and two daughters, when he was presented in 2016 with the opportunity to work with

organic goldenberries through Terrafertil, he decided to give it a try. Terrafertil had been focused since 2011 on the production of organic goldenberries in Ecuador (see Box 1) and provided Marcelo with organic seedlings on credit and a package of organic practices for growing the fruits, including fertilizers using natural ingredients such as fruits and plants. Within five to seven months of planting, the goldenberry plants started to produce fruit, and Marcelo experienced an abundant harvest, as the plants can produce fruit every week for between 12 and 20 months, earning it the moniker of a "blessed" crop.⁵



Marcelo and other farmers in the area who started growing goldenberry for Terrafertil in 2016 and 2017 sold their harvest to the company every week at a fixed price, which provided greater income stability than he had experienced previously. Within a couple of years, he had expanded his

5. Co-author interview with Marcelo Gordon, April 18, 2022.

production, and goldenberry farming had become his family's primary source of income. He was, therefore, devastated in early 2020 when, due to the arrival of *mancha morada* to the region, he lost over 2,200 of his goldenberry plants.

2.1 Goldenberry: A good livelihood for smallholders

Goldenberry (*Physalis peruviana*), also known as “cape gooseberry,” is a sweet-tart, shiny yellow berry enclosed in a green, papery, lantern-shaped husk. The plants, cultivated by the Incan civilization, are native to the Andes region and have adapted to the mountainous highlands in Colombia, Peru, and Ecuador over thousands of years (Nature's Heart, 2022). Containing naturally high amounts of fiber, iron, potassium, and vitamin A, the berries have started to gain popularity in U.S. and European markets as a “superfood” and can be found in many specialty stores, often promoted for their health benefits (Fundación Humana, 2019).

As a production crop, goldenberries are considered relatively easy to grow, and they produce their first harvest quickly, typically within five to seven months of initial planting. Once the harvest begins, the fruits can be picked weekly throughout the year, for a period of up to two years, providing a long-lasting and stable source of income. However, the plants require almost daily attention to grow and produce fruit, which makes them most suitable for small-scale production—where farmers can check on them frequently and give the plants individualized attention—rather than mass production on large farms. For that reason, as Terrafertil grew and built international demand for goldenberries, the company found itself needing to increase the number of smallholder producers in their Ecuadorian network.⁶

6. Co-authors interview with José Miño, May 18, 2022.

7. Co-authors interview with José Miño, May 18, 2022

Box 1: Terrafertil: Bringing Commercial Goldenberry Production to Ecuador

Terrafertil was founded in 2005 by three brothers from Ecuador as a natural food company focused on supplying traditional food products from the Andes region, such as chia, organic cacao powder, wheatgrass powder, and others. With a portfolio mainly focused on organics, by 2010 Terrafertil had established one of Latin America's leading natural food brands, Nature's Heart (Culliney, 2018).

In 2009, the company started working with goldenberries in Colombia, and, in 2011, they initiated production of organic goldenberries in Ecuador, starting with 30 smallholder producers in the Pimampiro and Chuga regions in Imbabura province.⁷ The company helps farmers start growing goldenberries by supplying them with organic seedlings and soil nutrients on credit and at cost. Terrafertil then commits to buy all the farmers' production at fixed costs, enabling farmers to earn a 50% margin (AlphaMundi, 2013).

Thanks to the profitability of goldenberries as an organic production crop, by 2022 Terrafertil was working with around 1,000 smallholder producers in 20 different farmer associations across Ecuador. According to the company's website, since 2017, goldenberry sales through Terrafertil's Nature's Heart brand have generated over \$15 million in direct income to farming families in Ecuador and Colombia (Terrafertil, 2022). In recent years, the company has grown quickly, expanding to the United States, Mexico, Colombia, Ecuador, Peru, Chile, and the United Kingdom and is present in 17 other markets through strategic partnerships. In September 2018, Terrafertil was acquired by the multinational corporation Nestlé (Nestlé, 2018).



Goldenberry produced in Ecuador. Image Credit: Evan Marcus, courtesy of Aliados

In 2016, Terrafertil’s plant manager, José Miño, arrived in the towns of San José Minas, Atahualpa, and nearby towns that form part of la Ruta Escondida, looking to introduce goldenberry production into the area. Despite being native to the area and commonly found in small parcels, goldenberry, or *uvilla* as it is known locally, was not being produced commercially in that region at the time, and farmers were unaware that it had a market or could be a profitable crop. José, therefore, faced some initial skepticism on the part of the farmers but managed to find two or three farmers who were willing to give goldenberry production a try, including a farmer named Daniel Valle (J. Miño, personal communication, May 13, 2022).

This initial small group of farmers was motivated in part by the model proposed by Terrafertil: The company offered a guaranteed market and fixed price for all the farmer’s production, as well as support and resources

to grow the plants organically. Furthermore, the company provided field technicians and agronomists who conducted field reviews every eight days and held bi-monthly workshops on how to grow the berries and produce organic products.⁸ Given the quick time to harvest, the steady stream of predictable, weekly income, and the profit margins farmers received from goldenberry production, the group of farmers from la Ruta Escondida grew quickly to 10, then 20, and then 40 farming families.⁹

During the second year of working with farmers in San José de Minas, José started to advocate for the farmers to establish a farmer association. Over the years of working with smallholder farmers across Ecuador, José had seen that establishing farmer associations was beneficial not only for farmers, but also for Terrafertil, as the company could collect the harvest from fewer designated spots, increasing efficiency, facilitating logistics, and improving profits. When he first raised the idea with farmers, they expressed some resistance due to the unfamiliarity of the idea, but according to José, Daniel Valle and other farmers eventually understood the benefits and opportunities of forming an association (J. Miño, personal communication, May 13, 2022).

In 2018, a group of farmers from across four different towns (*parroquias*) in la Ruta Escondida who had been working with Terrafertil joined together to establish a farmer association, the Asociación de Productores Agropecuarios de Ruta Escondida, which was registered under the Ministry of Agriculture/Ministry of Social Inclusion and Economic Solidarity in Ecuador. Once the association was formed, the members created a board of directors to provide better leadership, and Daniel Valle was elected as the association’s president. Soon thereafter, the group realized that they needed to become more inclusive, so they recruited additional families and quickly grew to approximately 60 farming families.¹⁰

8. Co-author interview with Marcelo Gordon, April 18, 2022.

9. Co-authors interview with José Miño, May 18, 2022.

10. Co-authors interview with José Mino, May 18, 2022.

Prior to the onset of *mancha morada*, goldenberry production was generating thousands of dollars per month in steady, predictable revenue for these families—a significant increase over their earnings in their previous farming activities. In a video produced by Terrafertil, one member of the association describes how he planted 800 goldenberry plants in his first season, harvesting 400 kilos of berries per week and receiving a payment of \$1.35 per kilo from Terrafertil. Based on that positive experience, he increased his production to 1,200 plants in the next season (Fundación Aliados, 2022). This experience was shared by others in the association, most of whom had increased their production to between 1,000 and 1,500 plants at the time the *mancha morada* began to start noticeably affecting goldenberry crops in 2019.¹¹

2.2 The arrival of *mancha morada*

In the summer of 2018, a debilitating crop disease known locally as *mancha morada* or *punta morada* started to appear on farms in the vicinity of la Ruta Escondida, affecting goldenberries as well as other related crops such as *tomate de árbol* (tree tomato) and potatoes. “We heard about some initial outbreaks, but at first we didn’t pay much attention to it, because we had encountered diseases with similar symptomology in the past,” said José Miño from Terrafertil.¹²

Marcelo recalls that when he first started hearing about the disease in the area, it was primarily affecting farms growing *tomate de árbol* in the vicinity of la Ruta Escondida, and farmers were similarly unaware of what the disease was or how it worked: “At first, people thought it was just a regular plague that could be effectively dealt with by using conventional chemicals, but that wasn’t the case. The farmers didn’t know about the existence of *mancha morada*, so they ended up all losing their tomato crops, just like we did, since the

11. Co-author interview with Wain Collen, April 5, 2022.

12. Co-authors interview with José Mino, May 18, 2022.

13. Co-author interview with Marcelo Gordon, April 18, 2022.

Box 2: About *mancha morada*

Mancha morada, also known as *Punta Morada de la Papa* (PMP) is a relatively recent plant disease that occurs in plants in the potato or *Solanaceae* family, which includes potato, tomato, peppers, ground cherries, eggplant, and tobacco. This disease has been detected around the world and has recently entered Ecuador starting with potatoes and *tomate de árbol*. The disease is caused by a phytoplasma, which is a bacteria without cell walls, that enter the plant through the vector of an insect called *Bactericera cockerelli*, which is commonly known in Ecuador as *paratrioza*. Once a plant has been infected, symptoms include yellow and curled leaves, and the appearance of purple spots, which gives the disease its common name of “purple stain” (*mancha morada*) or “purple tip” (*punta morada*) (Government of Ecuador, 2021).



A goldenberry plant affected by *mancha morada*.
Image Credit: Evan Marcus, courtesy of Aliados

plague attacks plants in the *Solanaceae* family, like tree tomato and goldenberry” (see Box 2).¹³

Local farmers and the staff from Terrafertil quickly learned, however, that *mancha morada* was no common plague, but rather a highly aggressive plant disease



A member of the Ruta Escondida farmer association caring for her goldenberry plants. Image Credit: Evan Marcus, courtesy of Aliados

previously unknown to Ecuador, which destroyed entire crops of goldenberries, tree tomatoes, and other affected plants within weeks of initial infection.¹⁴ Narcisca Puma, an agronomist with the Ecuadorian nonprofit organization Aliados, described *mancha morada* as follows: “Once several plants in a field are affected, the disease spreads rapidly, and when it’s a severe case, within 15 days the entire crop [of goldenberries] is decimated.”¹⁵ Marcelo Gordon recalled that when the disease first arrived in the communities, “we didn’t know what to do until an engineer from the Ministry of Agriculture—who had been to Mexico and therefore knew what *mancha morada* was—came to visit us. Once he came to the communities, he was able to identify the plague and alert us that it was *mancha morada*.”¹⁶

By 2019, staff from Terrafertil started to recognize the severity of the outbreak, as well as its potential to

decimate their supply chain of goldenberries and began work to determine what the cause of the disease was and how it worked. “We sent samples for analysis, but neither the governmental authorities nor the universities could figure out what the problem was,” recalled Terrafertil’s plant manager, José. “In the universities, they even tried to analyze its DNA, but the studies were inconclusive.”¹⁷ According to José, it was only when major potato producers began to be affected that the government started to take the problem seriously and create a plan of action to address the disease specifically in potato cultivation (Government of Ecuador, 2022).

While government scientists worked to understand the disease, its vectors, and how it spreads, farmers in la Ruta Escondida started to feel the impacts of the outbreak more directly. By summer 2019, people were noticing the spread of *mancha morada* in the towns belonging to la Ruta Escondida, and farmers were seeing the beginnings of what would quickly develop into a major livelihood threat for the communities. Rubi Encalada, a member of the Ruta Escondida farmer association, shared that she “started planting goldenberry when my sister started; she encouraged me to plant them, so we did, and luckily for us, we harvested a lot of goldenberry; everything turned out really well. But the second harvest went really poorly because we lost almost everything” (Fundación Aliados, 2022).

Like Rubi, other farmers quickly started experiencing similar losses, as previously healthy goldenberry fields were decimated by the fast-moving disease. By early 2020, farmers in the Ruta Escondida farmer association had lost between 90% and 100% of their goldenberry crops, causing their harvests to plummet.¹⁸ Prior to the onset of the disease, the 30

By early 2020, farmers in the Ruta Escondida farmer association had lost between 90% and 100% of their goldenberry crops.

14. Co-author interviews with Marcelo Gordon and Daniel Valle, April 18, 2022.

15. Co-authors interview with Narcisca Puma, April 6, 2022.

16. Co-author interviews with Marcelo Gordon, April 18, 2022.

17. Co-authors interview with José Miño, May 18, 2022.

18. Co-author interviews with Marcelo Gordon and Daniel Valle, April 18 2022.

farmers in the Ruta Escondida association were sending 4,000 kilos (4.4 tons) per week of fresh goldenberries to Terrafertil for collection and processing; this number dropped to 800 kilos (.8 ton) per week by early 2020.¹⁹ At Terrafertil, José was seeing a similar drop in production across the communities they sourced from: “Before the arrival of *mancha morada*, we were collecting 15 tons a week; during the *mancha morada* outbreak this number fell to just one ton a week.”²⁰

This reduction in production, in turn, had stark economic effects on the farming families in la Ruta Escondida, many of whom, like Marcelo, had shifted their production in recent years away from traditional crops and over to goldenberries. “I was hitting rock bottom,” recalled Marcelo, who lost 2,200 goldenberry plants. “This was the only form of employment for my family.” Seeing his crops devastated so quickly, Marcelo concluded that he would need to give up goldenberry cultivation altogether. “I sent a notification [to Terrafertil] that

in 15 days I was going to remove my few remaining goldenberry plants because they were going to die.”²¹ He was not alone in this assessment, as many other local farmers had come to the same conclusion, feeling that it was hopeless to try to continue with goldenberry and that the best course of action was to switch back to a more conventional, unaffected crop.²²

It was at this time of economic struggle for farming families in la Ruta Escondida – which coincided with the onset of the global COVID-19 pandemic – that a new local actor entered the scene, catalyzing an innovation process that would lead to the recuperation of goldenberry production in la Ruta Escondida and surrounding communities just two years later. The following chapter describes this process, and how through it, farmers in the Ruta Escondida association have been able to recover 90% of their previous goldenberry production levels, as well as nearly all their pre-*mancha morada* income.

19. Co-author interviews with Daniel Valle, April 18 2022.

20 Co-authors interview with José Miño, May 18, 2022.

21 Co-author interviews with Marcelo Gordon, April 18 2022.

22. Co-authors interview with Narcisca Puma, April 6, 2022.

3. Success through joint innovation and regenerative agriculture

When *mancha morada* started to become a major concern for Ruta Escondida's farmers and Terrafertil, the company had just partnered with Aliados (which translates to "allies" or "partners" in English), a nonprofit organization based in Quito, Ecuador. Formed in 2018 as a merger between two existing organizations based in Ecuador but with strong international ties, Runa Foundation and PlanJunto, Aliados was focused on partnering with smallholder farmers and farmer associations in the Ecuadorian Amazon to help them adopt ecologically sustainable farming practices and generate profitable "bioeconomy" businesses that could be connected with internationally based supply chain partners looking to strengthen their corporate social responsibility (CSR) practices.²³

In July 2019, Terrafertil approached Wain Collen, the executive director of Aliados, to propose a collaboration focused on strengthening Terrafertil's responsible procurement practices of goldenberry, as well as communicating these practices more effectively to external audiences. Terrafertil had been acquired by Nestlé in late 2018 and after having conducted a holistic evaluation of the sustainability performance of the company, identified the need for a standardized reporting system and improved metrics for their responsible procurement processes²⁴ (Terrafertil, 2022). A new collaboration was born between Aliados and Terrafertil, and together, both organizations created and launched the Goldenberry Plan in 2019, as described in Box 3.

The role of Aliados was envisioned as supporting the implementation of the Goldenberry Plan, ensuring that the plan's impact metrics were being followed and also advising Terrafertil on how to communicate their

Box 3: The Goldenberry Plan

The Goldenberry Plan, launched by Terrafertil in 2019, is the company's official corporate social value strategy and impact plan (Studer-Noguez, 2021). Developed in close collaboration with Aliados, the plan formalizes Terrafertil's commitment to responsible sourcing practices and places these practices and standards within a metrics framework that is aligned with the United Nations Sustainable Development Goals (SDGs) (Terrafertil, 2019). The plan focuses specifically on two complementary areas: improving sustainable incomes for smallholder farmers through goldenberry cultivation and improving environmental outcomes through committing to source 100% organic goldenberries in Ecuador, which provide a viable replacement crop for farmers involved in the pesticide-intensive global flower production industry (Terrafertil, 2022). The sustainable procurement commitments and associated metrics articulated in the plan provided the corporate policy framework and action plan that set the stage for the direct work in local communities related to goldenberry production and rehabilitation that would take place starting in 2020, as described in the remainder of this chapter.

work to farming communities and external stakeholders alike.²⁵ To play that role effectively, it was agreed that Aliados needed to get involved directly in the farming communities, so Terrafertil introduced Aliados to four farmer associations in the Ecuadorian Andes, including Ruta Escondida, where the focus would be strengthening farm profitability as well as management and governance within the association.²⁶

23. Co-authors interview with Wain Collen, March 22, 2022.

24. Co-author interview with Wain Collen, April 5, 2022.

25. Co-authors interview with José Miño, May 18, 2022.

26. Co-author interview with José Miño and with Caro Engel, May 18, 2022.

3.1 Launching a process to address *mancha morada*

With his background in sustainable environmental innovation and his prior work with Indigenous smallholders in the Amazon (see Box 4), Aliados' Executive Director Wain Collen was a strong advocate of community enterprise and regenerative agriculture practices as the means to sustainably increasing farm productivity and farmer incomes. He also brought experience in co-innovating sustainable, "bioeconomy" business opportunities with farming communities through experimentation and had previously worked on joint innovation projects involving a number of lesser-known Amazonian superfoods, including guayusa, jungle peanuts, and agave.²⁷ To start advancing this kind of work through the Goldenberry Plan, Aliados applied for and received a three-year grant from Fundación Crisfe to work on strengthening farmer associations and farmer profitability in the communities that supplied Terrafertil with goldenberries.

When Aliados kicked off operations of the Goldenberry Plan in January 2020 and first visited the communities where they would be working, they saw the crisis posed by *mancha morada* to goldenberry production and to these communities. Wain quickly realized that Aliados needed to pivot in their approach and channel their new grant resources entirely toward addressing the disease: "Suddenly, the main priority became addressing [*mancha morada*], because farmers were seeing their incomes crash, and the company [Terrafertil] wasn't able to buy enough product. So for both of these actors, it was clearly the priority."²⁸

With the new grant resources from Fundación Crisfe, in April 2020 Aliados hired Narcisa Puma, a local agronomist from a nearby community called Santa Rosa de Cuzubamba. Naturally curious, with a love for experimentation and innovation and an existing passion for regenerative agriculture, Narcisa seemed to be a perfect fit for the job, and well-aligned with Aliados' vision for

27. Co-authors interview with Wain Collen, March 22, 2022.

28. Co-author interview with Wain Collen, April 5, 2022.

Box 4: About Aliados

Aliados is a nonprofit organization formed in 2018 from the merger of Runa Foundation and PlanJunto, an organization founded in 2014 by Wain Collen, who has served as the executive director of Aliados since its inception. Aliados's mission is to "connect smallholder farmers to global markets through regenerative agriculture, unlocking new value for the world's most biodiverse landscapes" (W. Collen, personal communication, July 6, 2022).

Upon rebranding as Aliados, the new organization sought to build directly on the prior experience and success of Runa Foundation and Runa LLC in creating the first organic, fair-trade guayusa value chain with Kichwa Amazonian farmers. The vision was to take the Aliados team's experience with guayusa and replicate it with other ecologically sustainable products and communities in Ecuador's most biodiverse areas. More ambitiously, Aliados' vision is to transform the way business is done in the Amazon (W. Collen, personal communication, July 6, 2022).

This vision has led Aliados to a model that operates at three levels. At the farm level, Aliados introduces farmers and farming communities to regenerative agriculture practices, which are more sustainable, productive, and profitable for farmers. At the local business level, Aliados helps groups of farmers associate into "bioeconomy businesses," small enterprises comprised of farmers who can provide intermediate value chain services such as processing, packing, certifying, and transporting food products. At the corporate level, Aliados works with a portfolio of responsible corporate partners to identify areas of demand for products they are experimenting with at the farm level. Once demand for a particular product has been identified, Aliados goes back to the farmers to set up production and processing capacity for the new product, implemented through a community of practice format. (Continued on next page)

(Box 4 continued) This involves identifying the pioneering farmers who want to work with them and then implementing a “co-execution” model with these farmers. In an interview with our research team in March 2022, Wain described this model as follows: “We’ll provide the inputs, we’ll provide finance for you to try these new things, but you have to put your time in, to identify if this grows, and what’s the best farming practice... we have to learn together. That’s the community of practice format.”

the initiative, according to Wain. Additionally, Narcisa had experience working with farmers in the region and had some prior direct knowledge of *mancha morada*, as it had been affecting other crops before it started to appear in goldenberries. Trusting her expertise, Aliados gave her full control over the technical aspects of tackling *mancha morada* in goldenberry.²⁹

In keeping with their previously successful community of practice approach, the Aliados team chose a strategy that would involve setting up communities of practice – comprised of pilot cohorts of the most eager and willing farmers – in each of the five farmer associations with whom they were working. According to Wain, “Our goal was not to work with all the farmers, but to select the pilot cohort in each farming association. Selection was really important; we wanted farmers who were, more than anything, eager to learn and willing to try something new.”³⁰ Due to the COVID-19 pandemic, it was initially difficult for Narcisa to travel to visit these communities, but after a few months of delay, in June 2020 she was able to start making her first visits to the communities to identify the “pioneering farmers” who would participate in the pilot project.

29. Co-author interview with Caro Engel, May 19, 2022.

30. Co-author interview with Wain Collen, April 5, 2022.

31. Co-author interview with Wain Collen, April 5, 2022.

Aliados planned to give each of the pioneering farmers who volunteered to participate in a pilot a micro-grant of around \$200 USD to invest in inputs for the soil, specifically biofertilizers that would strengthen the plants’ natural defense systems and help them overcome the disease. At that point in time, each farmer had about ¼ hectare under goldenberry production with around 300 trees left, a precipitous drop from the 1,000-1,500 plants each farmer had two years prior, before the onset of the disease (interview with W. Collen, April 5, 2022.) As a result, farmers were short on cash to invest in an experimental innovation process of the sort that Aliados was proposing. Wain recounted that “with Narcisa, we identified: What does each farmer need? Because it’s not fair to ask a farmer to test a new farming technique by putting their own money in, especially after completely losing their previous crops to the disease. We had a new idea, and our role was to support the farmers to try new things to solve this problem... So we went to the pioneering farmers and said, okay, we’re going to give you inputs and training, and we’re going to try to solve this problem together.”³¹

Narcisa brought this proposal for experimental seed funding, inputs, and a package of regenerative



Narcisa Puma at a goldenberry farm. Image Credit: Evan Marcus, courtesy of Aliados

agriculture techniques she was familiar with to the farmers in the communities with whom she met. While a few farmers showed immediate interest, many others were initially skeptical and hesitant. “When the *mancha morada* plague hit, many farmers simply did not want to continue with goldenberry farming,” recalled Narcisa. “The extent of the damage was such that the farmers didn’t want to continue with their crops, despite depending on these crops for their livelihood, because they had a guaranteed market.”³² Because of this low morale, many farmers were uninterested in a process to recuperate their goldenberry production.

Another challenge was that Aliados did not have a history of working in these specific communities and lacked credibility with the farmers and farmer associations. Furthermore, according to Narcisa, some farmers had recently started losing faith in organic, nonchemical approaches to combatting *mancha morada*, as they had been using organic inputs and treatments provided by Terrafertil but these were not working to combat the outbreak. Narcisa identified in her conversations with farmers that part of the problem was that farmers lacked the knowledge required to apply the organic inputs and treatments correctly in terms of dosages and timing of application. She noted that “before, they didn’t have careful control, they didn’t maintain fixed parameters for soil nutrition, pest and disease control... they were doing the practices before, but not consistently or uniformly.”

To address this skepticism, low morale, and lack of understanding on the part of the farmers of what was required to effectively combat the disease, Narcisa decided to speak with farmers directly. “We went door to door, explaining to them what we were going to do, how we were going to change the methodology [of addressing *mancha morada*]” said Narcisa. “It was a very detailed and careful process of knowing how to approach them as technicians and raise their awareness and explain to them that there are new techniques [of regenerative agriculture] and



Daniel Valle with his family. Image Credit: Aliados

that with these new bio-inputs, it is actually possible [to rehabilitate the plants]... however, they will need to apply the products more frequently. If before they fertilized once per month, now they would need to fertilize a minimum of once per week.”

While many farmers remained skeptical, a few farmers were interested in trying what Narcisa was proposing. Daniel Valle, the president of the Ruta Escondida farmer association, and, according to Narcisa, an “incredibly dedicated leader and motivator in his community” was one of them. Daniel was willing to try new methods because he had already been experimenting and had tried everything he could, and nothing had worked.³³ Marcelo Gordon, also a member of the Ruta Escondida association, was in a similar position. “At that point... I had nothing to lose and everything to gain,” he recalled.³⁴

3.2 Implementing the first pilot in la Ruta Escondida

Given the interest of a small group of farmers from the Ruta Escondida association, including Daniel Valle and Marcelo Gordon, Aliados staff decided to start their goldenberry work with this association as the first pilot in July 2020. “By then, things were really desperate,” Wain

32. Co-authors interview with Narcisa Puma, April 6, 2022.

33. Co-authors interview with Narcisa Puma, April 6, 2022 and Daniel Valle, April 18 2022.

34. Co-author interview with Marcelo Gordon, April 18, 2022.

recalled. “The production levels had been going down, and the farmers had started to move to another crop. We were feeling a lot of pressure from the company [Terrafertil], since the company had to tell their buyers that they don’t have organic goldenberries.”³⁵ Based on her initial visits to all four community associations in the previous month, Narcisa had concluded that the farmers from the Ruta Escondida association were the more proactive and communicative, the easiest to work with, and the “pioneers of the pioneers.”³⁶ Daniel discussed the proposed pilot with the members of the association, and they decided to move forward with the collaboration and prepare a trial plot that would be managed by Daniel and two other members of the association. Using the micro-grant of \$200 USD provided by Aliados, the trial plot would be planted with 300 new plants and would be used to test the regenerative agriculture methods and treatments proposed by Narcisa.

With the association on board, Narcisa’s next step was to conduct an initial assessment of the goldenberry farms and the current state regarding *mancha morada* in the four communities that participate in the Ruta Escondida association. “We start with a careful diagnostic and understand the situation,” said Wain. “Once we understand the situation, we present a proposal that is suitable to the needs of the community... that’s the first step, before you even start. Too many programs come with their solution, ABC, and they expect people to ‘receive’ the program. That’s not going to work; it needs to be tailor-made and designed with farmers.”³⁷ Narcisa’s field assessment served as an input into an initial plan of action she created for the Ruta Escondida association, which was informed by what Narcisa had learned about the disease as well as her knowledge of organic and regenerative agriculture practices and products.

The pilot started in July 2020, when a truck arrived in la Ruta Escondida with the first batch of biofertilizers.

Narcisa informed the small group of pilot farmers that the first step would be to nourish the soil with natural, plant-based inputs, or *bioinsumos* to strengthen the plants and make them more resistant to the disease. These inputs included the fermented “super-compost” *bocachi*; a liquid “compost tea” bio-fertilizer that was made freshly in the communities and tailored to the conditions of each community based on their climate, soil conditions, and the availability of specific plants needed to make it (Fundación Aliados, 2022); and a ready-made organic fertilizer from México based on amino acids and seaweed, which was previously unknown in the community and proved highly effective in combatting *mancha morada*.³⁸

The next component of the approach involved protecting the plants from the insects that transmitted the disease, which was accomplished through preparing natural bio-insecticides made with chili, garlic, and other readily available materials, and creating homemade insect traps (Fundación Aliados, 2022). Finally, Narcisa taught the farmers how to strengthen the goldenberry plants through techniques of plant care, including intercropping the goldenberry plants with oats (a technique that assisted with moisture retention and soil quality), trellising the goldenberry plants, and

“Too many programs come with their solution, ABC, and they expect people to ‘receive’ the program. That’s not going to work; it needs to be tailor-made and designed with farmers.”

pruning them down to one main stalk with four primary branches (Fundación Aliados, 2022). Narcisa recalled the instructions she provided to the piloting farmers as follows: “I told them that we’ll work continuously on this, but in a specific order; first, start with preparing the soil, then nourishing the plants, then controlling the insects, plague, and other diseases.”³⁹

35. Co-author interview with Wain Collen, April 5, 2022.

36. Co-authors interview with Narcisa Puma, April 6, 2022.

37. Co-author interview with Wain Collen, April 5, 2022.

38. Co-author interview with Marcelo Gordon, April 18, 2022.

39. Co-authors interview with Narcisa Puma, April 6, 2022.

In addition to sharing these specific products and techniques, Narcisa taught the farmers through regular workshops and field visits how to keep accurate and consistent records of what was happening with their plants, noting when they applied which products, how much product was being applied, how frequently it was being applied, and other details of documentation, which was an area where she had identified that the farmers needed capacity building. Wain emphasized the importance of this capacity building and careful accompaniment: “To transition into a new way of doing things requires really high-touch support and local learning where people can actually do things and see the results of what they’re doing and understand the change that’s taking place until it becomes a self-sustaining activity.” Wain continued, “That’s really clear to me. You don’t just tell people that if you apply a certain input, you’re going to have increased productivity. It’s not going to work that way.”⁴⁰



Daniel Valle (yellow shirt) discussing effective goldenberry cultivation practices with members of the Ruta Escondida association. Image Credit: Evan Marcus, courtesy of Aliados

The pilot approach pursued with the initial group of pioneering farmers proved crucial in providing an opportunity for these farmers as well as others to experience early results firsthand. Daniel and his

colleagues, who were highly motivated to recuperate their plants, followed Narcisa’s recommendations to provide improved soil nutrition “meticulously” and, according to both Daniel and Marcelo, they began to notice visible result in their fields within several weeks. Just one month after they started applying the regenerative agriculture methods to the trial plot, they observed that the plants looked much healthier. They invited other farmers from the Ruta Escondida association to come to see the results and learn about the process they had used to obtain them. Following that visit, 13 other members of the association from across the four neighboring communities volunteered to replicate the pilot on their farms.⁴¹

Aliados provided each of these 13 farmers with the same package as the initial three, including micro-grants of \$200 USD for natural and other inputs, which they provided in materials rather than in cash, technical assistance, and importantly, instructions to each keep a control plot, so that they could observe any changes and results for themselves and share these with Aliados and other farmers in their association.⁴² According to Narcisa, “[T]he farmers were able to evaluate the practices themselves because the plant starts to gain color, vigor; they see that the plant is building resistance to the disease. As compared to before, they saw a plant that was very weak, and as soon as it started to become affected [by *mancha morada*] it passed quickly towards death.” Marcelo reiterated the importance of experiencing results first-hand. “We discovered that when the plants are well fed, they are more resistant to the plague,” he recalled. “We started with biofertilizers, then constantly applied different types of organic products that we made or purchased every eight days.”⁴³

In addition to sharing their field data with Aliados, the piloting farmers were invited to share their knowledge and expertise, particularly regarding local plants with potentially useful properties for the various

40. Co-author interview with Wain Collen, April 5, 2022.

41. Co-authors interviews with Daniel Valle, April 18, 2022 and with Narcisa Puma, April 6, 2022.

42. Co-authors interviews with Caro Engel, May 19, 2022 and with Narcisa Puma, April 6, 2022.

43. Co-author interview with Marcelo Gordon, April 18, 2022.

bio-inputs such as fertilizers and insecticides. To avoid the plants and the insects becoming resistant to the bio-inputs, these products needed to be rotated every eight days. There was a need, therefore, to vary the recipes for the bio-fertilizers and bio-insecticides, and to be able to produce these locally as the farmers required significant volumes.

To begin producing the bio-inputs themselves, Narcisa asked the piloting farmers to share their ancestral knowledge about local plants that were available in the area and their specific properties. “Since we didn’t know about the plants that were endemic to the region, they explained to me the details and characteristics of the local plants, and together we worked to develop new recipes,” recalled Narcisa.⁴⁴ For their part, local farmers were familiar with the plants and their properties, but many did not realize that they could be used to prepare effective fertilizers and insecticides. Working together, Narcisa and the farmers jointly developed recipes that were tailored to the specific conditions of each participating community, in terms of soil, climate, and availability of the different plants. Marcelo said, “The practices and methods that Aliados shared with us were ones that we hadn’t learned about previously, so they shared their experience with us, and we shared our experience with them regarding our fight against the *mancha morada* and the artisanal products we had been making on our own.”⁴⁵

3.3 Gathering initial results and scaling the approach

About six months after they started applying the regenerative agriculture methods, in January and February 2021, Aliados gathered data from the Ruta Escondida association’s demonstration plot. When Wain visited the communities, he saw that the plants were looking

green and healthy, and although the farmers had not harvested yet, he recalled that “[F]or me, it was a major indicator that something different was happening here.”⁴⁶ The pilot farmers were noticing the improvements as well. After starting to treat his fields with the products recommended by Narcisa, Marcelo Gordon noticed an immediate turnaround: “After eight days, I applied the second dose of the product as recommended. In 15 days, the plants started looking better and changing color, and I decided not to get rid of all the plants as I had planned. In three weeks, 90% of the plants had recovered and were soaking up the nutrients from the soil” he recalled.⁴⁷

Wain shared these initial results with Terrafertil, although the reception was lukewarm. The company had expected to see more scalable results so they could rapidly ramp up the volume of production, which had fallen dramatically the previous year. However, the early and visible results from Ruta Escondida, while limited in scale, gave Wain confidence that their process was headed in the right direction. Wain, Narcisa, and the Aliados team decided that it was time to start replicating the pilot process in other farmer associations where Aliados was working in the Imbabura province, specifically, in the town of Cotacachi.⁴⁸ Narcisa started visiting the other associations, beginning with the Azama association, followed by Mabe and Chakrata associations. With the proof of concept provided by the pioneering farmers in the Ruta Escondida association, Narcisa said, “[N]ow there is more participation from the other producers—they can see that their neighbor or the farmer from another association has produced goldenberry following these techniques of regenerative agriculture and making bio-inputs, so they have joined in and now we are walking this path with them as well.”⁴⁹

With Narcisa’s help, Aliados also launched a pilot in Cuzubamba (Narcisa’s home town) with a group of

44. Co-authors interview with Narcisa Puma, April 6, 2022.

45. Co-author interview with Marcelo Gordon, April 18, 2022.

46. Co-author interview with Wain Collen, April 5, 2022.

47. Co-author interview with Marcelo Gordon, April 18, 2022.

48. Co-authors interviews with Wain Collen, April 5, 2022 and with Narcisa Puma, April 6, 2022.

49. Co-authors interview with Narcisa Puma, April 6, 2022.

farmers who had not worked with goldenberries. Cuzubamba did not yet have a farmer association, but in response to some community members' interest to have a second income stream, Narcisa helped to set up a community of practice there and community of practice members have since been working toward becoming an association.⁵⁰ Like the farmers in la Ruta Escondida, before starting to work with goldenberries, farmers in Cuzubamba cultivated beans, corn, and potatoes, which did not generate a stable income.

As in la Ruta Escondida, most farmers in Cuzubamba were initially skeptical of growing goldenberries, since they were unaware of its commercial potential and had misinformation about organic growing techniques from previously failed attempts to grow roses organically. One of the first farmers to experiment with growing goldenberries in Cuzubamba was Flor Jiménez, who was motivated by the prospect of having a more stable income and improved financial situation, as well as being able to produce a crop organically that could contribute to improved local nutrition. The only member from her family of six to volunteer for the pilot, Flor started out planting 250 goldenberry plants in November 2020. Within six months of planting, she was able to harvest her first crop of goldenberries, sending 1.5 kilos to Terrafertil for collection.

Prior to the arrival of *mancha morada*, Flor had no prior experience with pests on her farm, so when the disease first arrived in Cuzubamba in the summer of 2021, she did not know how to control the disease. She relied on Narcisa's support in teaching her and a handful of other pioneering farmers to learn how to create bio-inputs and insect repellents using the methods and locally adapted recipes that had been piloted with the Ruta Escondida association. Flor recalled, "With the support of Aliados, we were able to learn that that the very same plants that we had in our fields could be used for fertilizers and repellents."⁵¹ After starting



Flor Jiménez in her fields. Image credit: Evan Marcus, courtesy of Aliados

to implement the regenerative agriculture practices, Flor—like the farmers in Ruta Escondida—began to see visible improvement in the health of her plants, which were healthier, greener, and showed greater vitality.

Soon, the neighbors began to take interest in the organic practices that Flor was piloting. Her family members, who had initially been skeptical of the pilot, changed their minds and, in September 2021, decided to move forward with planting 300 additional goldenberry plants. As of the time of interviewing Flor for this case study, this new group of plants was seven months old and had produced around 600 kilos of goldenberries without being affected by *mancha morada*, enabling her family to send between 25 and 30 kilos of fruit to Terrafertil each week. This new income source, in turn, has enabled Flor to resume her education and start pursuing her dream of becoming an English teacher.⁵²

50. Co-author interview with Caro Engel, May 19, 2022.

51. Co-author interview with Flor Jiménez, April 18, 2022.

52. Co-author interview with Flor Jiménez, April 18, 2022.

3.4 Building capacity through local promoters

During this time, similar results were being achieved in Ruta Escondida, which contributed to rapid growth in interest among the association's farmers in the use of regenerative agriculture practices and in cultivating goldenberry. A year into the pilot on the initial demonstration plot, Daniel Valle and other farmers could see definitive results of their work: "We realized that if we used only the organic products, the plants became more robust and more resistant to the disease," said Daniel.⁵³ Aliados' staff also took note of the pilot's success and the enthusiasm it was generating in the community. "By the second half of 2021," said Wain, "I went back to Ruta Escondida and felt that there was a really good vibe. People were excited."⁵⁴

The excitement from the results of the regenerative agriculture experiments was further fueled by Terrafertil's decision to increase the price of goldenberry from \$1.08 to \$1.45 per kilo in response to ongoing shortages in their supply chain.⁵⁵ In addition, based on the initial promising pilot results from the Ruta Escondida association, Aliados had decided to secure additional grant funding to be able to put more resources into supporting farmers with the initial package of organic inputs they needed to get started with the approach. "You have to put money into it," reiterated Wain. "That's what we're here for; we have the grant, and we can put the money into the needed innovation."⁵⁶ The support Aliados was able to provide to farmers to cover the initial costs of transitioning to regenerative agriculture approaches, combined with the strong and visible results of those approaches in terms of plant health and disease resistance, motivated farmers who had abandoned goldenberry production or were not previously growing goldenberries to join the effort.

As the number of farmers who wanted to participate grew to more than 40, it became difficult for Narcisa to personally visit and supervise the plots of each farmer. Aliados began to see the need to identify and hire local "promoters" of the approach in each association to provide immediate support to farmers when Narcisa was not there in person. Wain shared, "We [realized that] as the group grows, we need a local knowledge base, so farmers can be helping each other." He asked Narcisa to identify the best person for the role of "local promoter" in each of the communities where she was working. Wain was specifically looking for "local people who are smart, committed, technologically literate – they need to be able to use cell phones at least, but hopefully computers as well."

In San José de Minas, one of the four communities that participated in the Ruta Escondida association, Marcelo Gordon was identified by Narcisa as meeting these criteria and hired by Aliados in the spring of 2021 as one of two local promoters. Marcelo told us, "As a promoter, I give guidance and advice to the new members of the association so they can start [goldenberry farming] from scratch."⁵⁷ When a farmer wants to start planting goldenberry, Marcelo or a technician from Terrafertil will go to the new plot to check the surroundings to identify if there are any risks of contamination or use of chemicals. If a farmer can meet the conditions required for organic production, then Marcelo registers the plot and helps the farmer order the goldenberry seedlings from Terrafertil.

He provides guidance in implementing and documenting the regenerative agriculture practices and visits farmers once or twice a month to see if they need any help and if they do, to provide technical assistance. Marcelo and other local promoters are paid daily for their work by Aliados, and they communicate with Narcisa

53 Co-author interviews with Daniel Valle, April 18, 2022.

54 Co-author interviews with Wain Collen, April 5, 2022.

55 Co-authors interviews with Daniel Valle, April 18, 2022, José Miño, May 18, 2022 and Narcisa Puma, April 6, 2022.

56 Co-author interviews with Wain Collen, April 5, 2022.

57 Co-author interview with Marcelo Gordon, April 18, 2022.

through WhatsApp so they can provide updates and ask questions as needed. “I call them ‘soil doctors,’” Wain says. “[T]he soils are ill, and even if it’s organic farming, they’re degraded, and they need to be healed. Narcisa comes and diagnoses the problem with the soil through soil analysis, and she comes up with a recipe like you get at the doctor’s. And the promoters need to be the same; they need to be able to diagnose the problems with the soil and prescribe the medicine as necessary.”⁵⁸

Through the rigorous application of regenerative agriculture methods, local co-innovation and experimentation, and local capacity building with the farmers, the members of the Ruta Escondida association were able to successfully overcome *mancha morada* and achieve nearly 90% of their previous production levels by the end of 2021.⁵⁹ This generated increased income for the association, which earned \$75,000 in 2021—three times more than the previous year when they were struggling with *mancha morada*.⁶⁰ According to Narcisa, “there is still *mancha morada* [in the community], but not in the high percentages that there were before, and now it’s possible to produce goldenberry again. We did a baseline study at the start of the pilot, and at that time there were producers who were only able to harvest 10 or 20 kilos [per week] from 300 plants, and others were losing their harvest entirely. Now, with

all these regenerative agriculture practices that we have been implementing, from 300 plants there are producers who are able to produce 100 to 120 kilos of goldenberry weekly.”⁶¹

The ability of the association to recover its production and income has, in turn, helped to recruit more farmers to join the association. As of spring 2022, Ruta Escondida had about 60 farmers and is doing very well, according to Wain, and these results are being replicated across the other associations. Across the five associations that Aliados works with, fewer than 50 farmers had participated in the initial pilots, but by spring 2022 that number had grown to 200 farmers and was continuing to grow. In March 2022, Wain Collen visited the associations to gather feedback about the progress so far. He received unanimously positive feedback, even from the association and individuals within that association who had expressed the most skepticism in the beginning. One particularly critical farmer now showed Wain that his goldenberry crops were strong and healthy 18 months after he started applying the regenerative agriculture practices. Wain saw this turnaround in production and in farmer attitudes toward the process as evidence that Aliados is heading in the right direction with its approach.⁶²

58. Co-author interviews with Wain Collen, April 5, 2022.

59. Co-author interviews with Daniel Valle, April 18, 2022 and with Marcelo Gordon, April 18, 2022.

60. Co-author interviews with Wain Collen, April 5, 2022.

61. Co-author interviews with Narcisa Puma, April 6, 2022.

62. Co-author interviews with Wain Collen, April 5, 2022.

4. The evolution and results of the innovation process

The local innovation process in the communities Aliados worked with through the Goldenberry Plan started with capacity building and joint experimentation to develop locally adapted regenerative agriculture practices that could effectively combat *mancha morada* in goldenberries. As these practices began to produce the promising initial results described in the previous chapter, the momentum generated by those results catalyzed additional processes of joint experimentation and innovation, now led by the farmers themselves. This chapter describes the evolution of the local innovation process in these communities and the varied changes and results that started to emerge from this dynamic, co-evolutionary process.

4.1 The launch of a farmer-led bioeconomy business

As more farmers in the Ruta Escondida association joined the efforts to rehabilitate goldenberry production, Daniel Valle and a few other farmers recognized the need to expand local access to the bio-inputs that were needed for the approach.⁶³ They had noticed that some of the newer farmers in the association were having difficulty acquiring the organic ingredients that were needed to make the biofertilizers and bioinsecticides that Narcisa recommended. Many of these ingredients were only available in stores in the town, but the farmers lived miles away from town and had difficulty accessing these products as frequently as needed. Furthermore, some products were only available in large quantities, but the farmers only needed small amounts to mix with other ingredients they already had, which

made purchasing the inputs impractical and costly for the farmers.⁶⁴

Discussing this challenge with each other, members of the Ruta Escondida association developed the idea to establish a local shop in San José de Minas that could provide farmers with access to the bio-inputs they needed. Members of the association had noticed that in addition to access to inputs, there were other hurdles for small farmers in the region to get started with regenerative agriculture practices. Therefore, they wanted the shop to be able to sell the inputs to farmers at a reasonable price and, in addition to providing access to inputs, to provide technical assistance to help them get started, so they knew how to properly use the bio-inputs.⁶⁵

Leaders from the association, including Daniel Valle, brought this idea to Aliados in the second quarter of 2021. Aliados staff were enthusiastic about this locally identified, logical next step and started working with the association to develop a business plan for a “bioeconomy business,” or *bio-emprendimiento*, as the farmers call it, which took around nine months to develop.⁶⁶ The final business plan was presented to Aliados in fall 2021, and in late fall 2021, Aliados gave the association \$5,200 USD as a seed grant to set up the new business.

With a business plan and seed capital in hand, the farmers were able to launch the new business in March 2022. In its first month of operations, the store generated \$600 USD in revenue from the sale of bio-inputs and is now providing farmers with local access to the ingredients and products they need at affordable prices.⁶⁷

63. Co-author interviews with Narcisa Puma, April 6, 2022 and with Daniel Valle, April 18, 2022.

64. Co-author interviews with Wain Collen, April 5, 2022.

65. Co-author interview with Daniel Valle, April 18, 2022.

66. Co-author interviews with Wain Collen, April 5, 2022.

67. Co-author interview with Wain Collen, April 5, 2022.

Three partners from the Ruta Escondida association lead the business, and they form the leadership committee and jointly make key decisions, with Daniel—as president of the farmer association—having the final word in decision-making. Additionally, the business involves several other members of the association, including one member who serves as the store administrator and a group of association members who are responsible for the store’s day-to-day operations. According to Wain, “[T]his is a local innovation—they identified that as a need, and what we did was provide access to capital and knowledge to convert that idea into a viable solution.”⁶⁸

4.2 Local production of bio-inputs and agricultural diversification

In addition to the store, other examples of farmer-led innovation activity have started to emerge in 2022. For example, while the store in San José de Minas provided access to inputs for farmers in la Ruta Escondida,

farmers in other associations farther away, such as Azama, Chacrata, and Nave in *cantón* Cotacachi, still lacked convenient and affordable access to bio-inputs. As a result, Narcisa shared that “[W]e saw a need to create small, artisanal *bio-fábricas* (bio-workshops or production centers) in each of the associations, so they could all have their own standardized source of inputs.”⁶⁹ To support these small production centers, Narcisa and the local promoters working with Aliados in each community have organized large workshops, where they jointly prepare with farmers 500 or 600 liters of inputs, and then distribute these to each community, so they have a standardized input source that they can then replicate on their own.

In addition to starting to produce their own liquid bio-fertilizers and insect repellents, farmers participating in the goldenberry work have started to experiment with generating their own sources of manure and other solid organic inputs for compost and fertilizer production. In Cuzubamba, farmers have started to raise their own guinea pigs, chickens, and cows to obtain the organic



The group of Ruta Escondida farmers in charge of the new supply store for bio-inputs. Image credit: Evan Marcus, courtesy of Aliados

68. Co-author interview with Wain Collen, April 5, 2022.

69. Co-authors interview with Narcisa Puma, April 6, 2022.

manure needed to make the compost and bio-fertilizers. Similarly, they have started to grow local chilies (*ají*) a key ingredient in the bio-insecticides.⁷⁰ In the four communities that participate in the Ruta Escondida association, farmers have also started to intercrop oats with their goldenberry plants, which help the soil around the plants to retain moisture and improve soil quality (Fundación Aliados, 2022).

As a result of their positive experience with regenerative agriculture, farmers who participated in the goldenberry pilots now have the skills, confidence, and know-how to experiment with planting other nontraditional crops for commercial purposes. Aliados staff have observed in recent community visits that farmers are now experimenting with diversifying into planting *choclo* (a local variety of corn), *avas* (peas), *fréjol* (beans) and *cebolla perla* (white onion) for commercial purposes, which they now also sell to Terrafertil.⁷¹ Farmers are also starting to use worms to create vermicompost, a practice they were not familiar with before the pilot.⁷² As a result of this crop diversification and the varied regenerative agriculture practices the farmers have been using, they and the Aliados staff have observed an improvement in soil quality and fertility.

According to Flor, in Cuzubamba most farmers used chemicals in their farming prior to joining the Goldenberry Plan, and their soil was degraded and not very productive. Cuzubamba and other communities that have started goldenberry production are located in the epicenter of the global Ecuadorian flower-producing region. According to Terrafertil, workers on flower farms can be exposed to over 120 different pesticides – some of which have been linked to higher rates of miscarriages, premature births, and babies with congenital birth defects. Furthermore, industrial flower production of the type found in the region is highly water-intensive, demanding three gallons of water for each rose produced (Terrafertil, 2022). Organic golden-

berry production offers an alternative that generates benefits for the environment and for farmers.

Since she and other farmers have begun implementing regenerative agriculture practices, Flor has observed that the plants she grows are taller, greener, and more productive without the use of any chemical inputs. She noted that the switch to organic growing practices is also contributing to the health of families in the community, as the food they consume is now free of chemicals. Since Aliados has taught the farmers how to keep careful records and document results in their fields, farmers are now able to see and appreciate the changes on their plots themselves, both in the health of their goldenberry plants and other crops. Narcisa said, “They can see the changes visibly; before we started using these techniques, their goldenberry plants measured a maximum of 50 or 60 centimeters, but now they can grow up to 1.4 or 1.5 meters, with a much larger production of fruit.”⁷³

4.3 New knowledge sharing and learning spaces for farmers

Prior to growing goldenberries, the communities where Aliados is currently working had little knowledge of organic growing methods. Most farmers, like Marcelo Gordon and Flor Jiménez, were growing traditional crops using conventional, chemically intensive growing methods, and in Marcelo’s words, “The knowledge about techniques of organic growing in this zone was essentially null.”⁷⁴ When Terrafertil first introduced organic goldenberry farming to the communities in la Ruta Escondida, their field technicians used to organize bi-annual meetings with the farmers to discuss various topics related to organic agriculture, and they used to have regular communication with the leaders of each farming association. According to Daniel Valle, upwards

70. Co-author interview with Flor Jiménez, April 18, 2022.

71. Co-author interviews with Narcisa Puma and Caro Engel, April 6, 2022 and with Flor Jiménez, April 18, 2022.

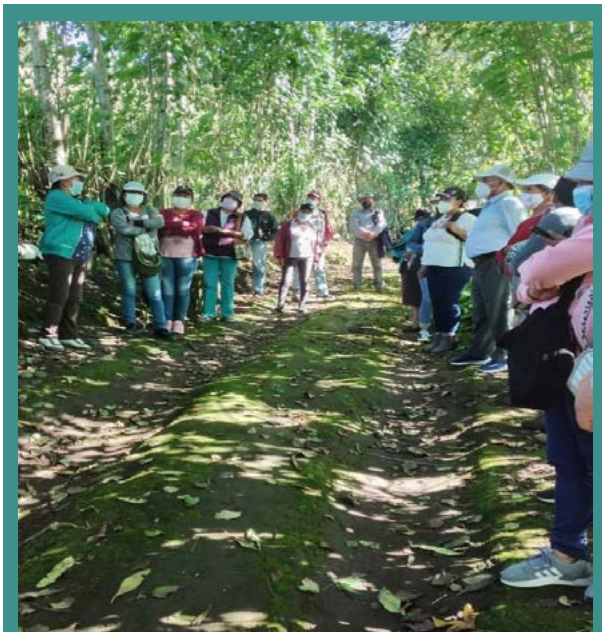
72. Co-author interview with Flor Jiménez, April 18, 2022.

73. Co-authors interview with Narcisa Puma, April 6, 2022.

74. Co-author interview with Marcelo Gordon, April 18, 2022.

of 600 farmers used to attend these meetings, but when the pandemic hit, the meetings were suspended and this space for learning was no longer available.

When Aliados launched their regenerative agriculture pilots, they needed to re-initiate regular spaces for peer learning and knowledge sharing between the farmers. Aliados' staff, led by Narcisa, set up a variety of learning and capacity-building spaces, including exchange visits between different farming associations to see early results on pilot plots, monthly meetings to demonstrate how to prepare the various organic inputs, and regular field visits that Narcisa and the local promoters made to provide on-site technical assistance and jointly resolve issues that emerged. "I am in constant communication with Narcisa," says Marcelo, "to let her know how we're doing, talk about the inputs, talk about upcoming field days, and share the knowledge with the other members of the association, so we can jointly define areas where we want to share our ideas and experiences with each other."⁷⁵



Members of the Ruta Escondida association attend a field session led by Daniel Valle. Image credit: Evan Marcus, courtesy of Aliados

"There is a very good relationship of learning with Aliados," Marcelo notes. "Now, there is even a small field school with the four communities of la Ruta Escondida, where new producers who are just joining the initiative can come together. All of us are supporting them by teaching them what we have learned, and Aliados keeps teaching

us as well." According to Wain, these processes of mutual learning are essential both for obtaining the results they have obtained so far and for ensuring the sustainability of the initiative in the future. "You have to generate tangible benefits to make this work. There needs to be a learning system whereby farmers can reflect upon what they've done – what's working out well and what's not – and how things need to be in the future. So it's like an adaptive learning system."⁷⁶

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4.4 Increased confidence and proactiveness in the farming communities

As noted previously, when Narcisa first visited goldenberry farming communities in spring 2020, many farmers had lost faith in organic production methods and were resigned to switching from organic goldenberry production back to chemically intensive methods of conventional farming. This was due largely to the fact that the organic products they had been using already to grow goldenberries, which had been recommended by Terrafertil, proved wholly ineffective at combating *mancha morada*.⁷⁷ As a result, all but the most

75. Co-author interview with Marcelo Gordon, April 18, 2022.

76. Co-author interview with Wain Collen, April 5, 2022.

77. Co-author interview with Narcisa Puma, April 6, 2022.

curious and innovation-oriented farmers, like Daniel Valle, Marcelo Gordon, and Flor Jiménez, were deeply skeptical of the regenerative agriculture techniques that Narcisa was proposing, and only a small handful of farmers initially agreed to pilot these methods, even with all the piloting costs fully covered by Aliados.

Two years later, Aliados staff observed that one of the most notable changes in these communities was the shift among farmers from skepticism to trust and from resignation to confidence and a more proactive approach to addressing emerging challenges and opportunities. “When Narcisa visits the communities and spends four days a week rotating between the communities, now the farmers trust her, and they routinely ask her questions and bring up their needs,” said Caro Engel, program director at Aliados. “New producers are always approaching with interest to participate and wanting the start-up producers’ kit and package of practices.”⁷⁸ Just a day or two prior to our interview with Narcisa and her colleague Caro, some producers in one of the communities had approached Caro with the idea to create their own intermediate nursery to be able to facilitate greater access to the goldenberry plant material. Currently, all goldenberry seedlings are produced and distributed by Terrafertil, so Caro saw this as an example of farmers’ identifying a challenge or bottleneck and coming to Aliados with their proposed solution, regardless of whether this solution is, in fact, viable given Terrafertil’s policies.

Another example of this increased confidence can be seen in how members of the farmer associations are engaging with other local stakeholders who have expressed interest in supporting the work with goldenberries. As the regenerative agriculture process began to produce tangible results in terms of recuperation of production volumes and local incomes, some municipal governments began to provide limited forms of local support to these initiatives; for example, the president of the Town Committee of San José de Minas has put some resources toward the process, and in Atahualpa, the town’s field technician started supporting the process through follow-up visits.⁷⁹

In Cuzubamba, Flor mentioned that the mayor of Cayambe provided some organic matter and plant material to the farmers, but the farmers agreed it was purely for “political interests and propaganda.” Now, these same farmers are considering a proposal to receive support from the Ecuadorian Ministry of Agriculture, “but we want to see what they will offer us and how they will offer it and ensure that [their help] isn’t just for their own political interests,” said Flor.⁸⁰ To consider this proposal, all 70 local goldenberry producers in this town have gotten together to discuss the ministry’s offer of support and to decide among themselves if they want to receive this support or not. Flor noted that the farmers now understand that the biggest source of support for their process comes from their own community and they have the agency to determine from whom else they receive support and under what terms.

78. Co-authors interview with Caro Engel, April 6, 2022.

79. Co-authors interview with Narcisa Puma, April 6, 2022.

80. Co-author interview with Flor Jiménez, April 18, 2022.

5. Conclusion: Factors contributing to success

In analyzing the factors that came together to produce a successful innovation process in this case, several are worth highlighting in this concluding section. Some of these factors relate to methodological aspects of Aliados' approach to working with communities, others to inputs that were provided to the process, and yet others to the complementary and mutually supportive roles played by the different stakeholders in the process, including members of the local farming communities. We will describe each of these different types of success factors briefly in the remainder of the conclusion, as they contain lessons for others seeking to catalyze or support similar types of multistakeholder innovation processes.

5.1 Aliados' approach to facilitating the innovation process

Aliados' staff emphasized that their approach to engaging with the communities featured in this case study prioritized several key components that were implemented in tandem by Narcisa and other field staff. The first and most critical component was a focus on relationship building and trust building with farmers, particularly those who were initially skeptical of trying to recuperate their goldenberry plots. This relationship-building and trust-building process required Narcisa to engage in door-to-door outreach as well as frequent and consistent follow-up with the communities, so that over time they could trust both her presence and the quality of her advice, based on results they were seeing with their own eyes.

The second, complementary aspect of the approach involved providing well-researched, well-tested technical

advice and capacity building on regenerative agriculture approaches and taking the time to work hand in hand with farmers to adapt these approaches to the local soil and climatic conditions, ensuring that the practices would work in the local context. This process of joint experimentation with farmers engaged them by drawing out their traditional knowledge and resulted in recipes that were tailor-made to each community's unique micro-climate and to the conditions Narcisa had identified in the baseline she conducted of each community. According to Wain, "It needs to be a tailored solution. [W]e don't arrive with just one cookie-cutter solution for everybody, so we start with a careful diagnostic, understand the situation. Once you understand the situation, we present a proposal for work that is suitable to the needs of the community, so it needs to be a tailor-made solution; that's the first step, before you even start."⁸¹

In tandem, the strategy of identifying "pilot farmers" and helping them to establish a pilot and control plot was key, as this created a context in which these farmers and others could start to appreciate emerging results with their own eyes. Wain reiterated the importance of this in his interview with us: "To transition into a new way of doing things requires really high-touch support and local learning where people can actually do things and see the results of what they're doing." The careful selection of these initial pilot farmers was also a key part of the approach, as these farmers became the most effective champions

"To transition into a new way of doing things requires really high-touch support and local learning where people can actually do things and see the results of what they're doing."

81. Co-author interview with Wain Collen, April 5, 2022.

of the approach once they saw it working on their own plots. Naturally proactive, innovative, and open-minded farmers like Daniel Valle, Marcelo Gordon, and Flor Jiménez were initially open to trying something new, followed the recommendations that Narcisa provided carefully and documented these thoroughly, and were, therefore, well-positioned to obtain results and be able to speak convincingly to other farmers about these results.

Some of these piloting farmers, like Daniel Valle, were also leaders in their communities already, so when they saw the effectiveness of the approach, they were able to disseminate information quickly and effectively through their existing networks to other farmers, helping the approach to spread within and beyond the communities where the first pilots took place. From an initial group of fewer than 50 farmers spread across five farming associations, Aliados is now working with over 200 farmers in those associations. “You need local agency, local leadership,” reiterated Wain. “So make sure that you have local people who are there developing the activity with you, implementing activities when you’re not there, developing solutions themselves; local leadership is key.”⁸²

To spread the approach beyond these pioneering farmers, Aliados staff had to provide consistent capacity-building support to an ever-widening group of farmers. This involved showing up consistently and predictably in the communities to provide ongoing support “for as long as is needed,” emphasized Wain, to ensure that recipes were being prepared effectively, diluted to the correct strength, applied in the right ways, and that all other aspects of the approach were being implemented correctly so that results could be consistently obtained and appreciated by farmers. Wain affirmed that “[i]n general, we have seen overwhelmingly positive results because Narcisa has been providing very high-touch support. Just giving farmers inputs is not enough; you have to provide integrated technical

support and social learning until it [the regenerative agriculture practices] become a self-sustaining activity.”

Together with technical support was the need for “risk capital,” seed money that the farmers could use to innovate in their fields. This was particularly important given how short on cash most farmers were in early 2020 when *mancha morada* became full-blown. It would not have been realistic in this context to expect farmers to invest their own capital in unknown bio-fertilizers and pesticides, or in new rounds of goldenberry seedlings on which to conduct experiments. “You have to invest,” says Wain. “Our role was to support farmers trying new things, to overcome the problem. So, we gave each farmer a grant comprised of farming inputs of about \$200 per farmer, to invest in 300 plants of goldenberries, which is not very much.” That initial infusion of inputs enabled farmers to kick-start the innovation process on their own plots, but “it has to be financially sustainable,” says Wain. “It needs to translate into improved incomes for farmers, and then there is a good chance that these practices will sustain themselves, and that farmers will be willing to continue to invest in these regenerative farming practices, because they have tested the practices and know they are going to work out for them.”⁸³

5.2 Other contributions to the innovation process

Apart from the key inputs and effective process facilitation offered by Aliados, there are several other contributions to the innovation process that are worth noting in closing. One of these relates to the role that Terrafertil played as a major supply chain partner in serving as the guaranteed buyer of these communities’ goldenberry production, at a fixed price that communities could count on. The commitment of Terrafertil to continue buying goldenberries throughout the pandemic period, combined with the incentive for

82. Co-author interview with Wain Collen, April 5, 2022.

83. Co-author interview with Wain Collen, April 5, 2022.

increased production they offered in the form of an increase in the price per kilo for goldenberries, provided farmers with full confidence that if they could figure out how to heal their plants and recover their productive capacity, they would have a guaranteed buyer for their full crop at a highly competitive price.

Another contribution that Terrafertil had made to the innovation process pre-dated the onset of *mancha morada* but was an important ingredient in the process, nonetheless. This consisted of working with farmers to establish farmer associations, such as the Ruta Escondida association, as noted in Chapter 2. While these associations still have work to do, according to José Miño from Terrafertil, in terms of strengthening their capacity for effective leadership and joint decision-making, the fact that they existed enabled Aliados' ability to identify pioneering farmers such as Daniel Valle and to form initial pilot groups in each of the communities served by these associations. The associations and the network of communication between leaders of these associations also proved instrumental in enabling farmers such as Daniel to quickly share their results with other communities, enabling the rapid uptake in interest among farmers to join the pilots and try the new approach.

Most important to the pilots' success was the interest and enthusiasm of farmers themselves, which is the most essential ingredient in any local innovation process that hinges on changing farmers' behavior and practices. As Narcisa observed, "They put their interest" into the process. "Our role as technicians was to organize

workshops, provide recipes and instructions, but without the participation of the farmers, this wouldn't have been possible. So there is a strong commitment on the part of the farmers who now believe that yes, it is possible to achieve success with organic agriculture."⁸⁴

This shift in motivation – from initial skepticism to enthusiastic commitment, from an unwillingness to plant new goldenberry seedlings to decisions to invest time and money in a joint innovation process – is something that must happen within each farmer who decides first to try these new practices and then to continue with them over time. It is a shift that cannot be directly controlled by external actors, as it is something that ultimately each farmer must decide on his or her own, taking numerous personal considerations into account. However, this shift can be motivated and effectively triggered through the kinds of approaches and activities described in this case study.

In particular, providing farmers with the opportunity to observe, measure, and assess results themselves, in purely empirical terms, is key. When farmers see concrete results and have the ability, motivation, and existing social capital and networks to be positioned to communicate these results with each other, an innovation process can spread quickly, as it has done in the Ecuadorian Andes. When that process continues to be accompanied, nurtured, and resourced over time by a committed local innovation broker such as Aliados, it stands a good chance to take hold, transform farming practices, and catalyze cascading innovations and enhanced local capacity to innovate.

84. Co-authors interview with Narcisa Puma, April 6, 2022.

Appendix A. Interviews and Other Personal Communications

Collen, Wain. Interview conducted on Zoom, March 22, 2022.

Collen, Wain. Interview conducted on Zoom, April 5, 2022.

Collen, Wain. Personal communications over Google docs, July 6, 2022.

Gordon, Marcelo. Interview conducted on WhatsApp, April 18, 2022.

Jiménez, Flor. Interview conducted on Zoom, April 18, 2022.

Miño Tovar, José. Meeting conducted on Zoom, May 13, 2022.

Miño Tovar, José. Interview conducted on Zoom, May 18, 2022.

Pichamba, Alberto. Interview conducted April 18, 2022.

Puma, Narcisa. Interview conducted on Zoom, April 6, 2022.

Engel, Caro. Interview conducted on Zoom, April 6, 2022.

Engel, Caro. Interview conducted on Zoom, May 19, 2022.

Valle, Daniel. Interview conducted on Zoom, April 18, 2022.

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